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STAFF LETTER

MEET OUR NEW EDITOR

STU ROSNER

Robert Pavone (left), associate publisher, and Larry Marion, editor-in-chief

Just 21 months ago, I assumed the editorial direction of *LOTUS* on an interim basis. Now, after a longer period than any of us expected, I am pleased to report that a new editor-in-chief has taken over my chair and my spot at the top of the masthead.

The new editorial leader is Larry Marion. He comes to us from *Institutional Investor*, a fine magazine that some of you know. Larry was a senior editor there, responsible for the magazine's coverage of technology and trading.

Larry has a B.S. in chemical engineering from Drexel University and an M.S. from Northwestern University's Medill School of Journalism. He spent six years as a field correspondent, editor, and bureau manager for various McGraw-Hill magazines. Since then, he's been a staff writer for *Forbes*, a senior editor of *Financial World*, assistant managing editor of *Datamation*, and managing editor of *Electronic Design*.

Larry has been particularly interested in the role of computers in business. He has contributed a regular column called Optimizing Business to *Personal Workstation* magazine. And he has often spoken at conferences on how companies use technology.

His arrival fits in well with changes we are planning here. We will continue to publish the kinds of articles we have published in the past. But we also plan to write a lot more about the ways business uses *1-2-3* and *Symphony*.

Just as you can learn technical proficiency from good tutorials, and just as you can learn to solve specific business problems with the help of good templates, so can you learn when and how to use spreadsheets from the examples of others. You've seen a few samples of this last approach in *LOTUS*. You'll soon see more.

The new editor-in-chief is not the only key staff change of late. Robert Pavone is our new associate publisher in charge of sales. He and his staff have the important task of persuading vendors to advertise in *LOTUS*.

Rob is an old hand in computer publishing. He began his career writing promotional copy for *Computer Decisions* and *Electronic Design* magazines. Since turning to sales and sales management, he has been national sales director of *Personal Computing*, *Network World*, and *High Technology Business*. He prepared for all of this by getting an M.A. in creative writing.

Rob was attracted to this job in part because he thinks you're a great audience for advertisers who want to reach the "Lotus market." I agree, and I hope he sells that message. Advertising will let you learn about more products you may need. And it will help us keep our subscription rate low.

John B. Campbell
Editorial Director

LOTUS

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LOTUS (ISSN 8756-7334) is published monthly by Lotus Publishing Corporation, a subsidiary of the Lotus Development Corporation, at One Broadway, Cambridge, MA 02142 Subscription rates, one year: U S and U S possessions, $24, Canada, $28, Foreign, $100 (airmail) Please allow four to six weeks for receipt of first issue Executive, Editorial, Circulation, and Advertising Offices. P O Box 9123, Cambridge, MA 02139-9123 Telephone (617) 494-1192 ©Copyright 1990, Lotus Publishing Corporation, all rights reserved *LOTUS* is a registered trademark Officers of Lotus Publishing Corporation: Mark D Flanagan, President, Thomas M Lemberg, Secretary, Robert P Schechter, Vice President of Finance and Operations, John W Martin, Treasurer, Elisabeth Folsom, Vice President Second-class postage paid at Boston, MA, and at additional mailing offices. Postmaster. Please send address changes to *LOTUS*, Subscription Dept , P O Box 56588, Boulder, CO 80322-6588

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LETTERS

RELEASE 3 PROBLEM ALERT

I want to alert everyone to a bug in *1-2-3* Release 3. The bug causes certain calculations to be off by one cent.

To see how it affects the worksheet, enter *2.365* in cell A1 and copy it to range A2..A12. Enter *0.01* in cell B1, *0.02* in cell B2, *0.03* in cell B3, and so on through cell B12. Then enter +A1+B1 in cell C1 and copy this formula to range C2..C12. Format range A1..B12 for fixed with 4 decimal places. Format range C1..D12 for currency with 2 decimal places.

As you can see, all the calculations are correct except those in cells C10 through C12. These are one cent short. No one seems to know why. Lotus Development Corp. suggested that I use the @ROUND function to get the correct answer. The formula @ROUND(A1..B1,2) didn't work. They told me to use @ROUND (A1,2)+@ROUND(B1,2), which I haven't yet tried. Can you imagine having to use this formula for every figure in a large spreadsheet?

Robert M. Aaberg
Cargill Marketing Co.
Mobile, Ala.

Editor's note: *We asked Lotus Development Corp. for a response. The company indicated that it became aware of the problem from monitoring the Product Support telephone calls and that it is investigating solutions. We hope to issue a more detailed response from Lotus soon.*

For now, try using the @ROUND formulas in cell D1 as Lotus suggested. Copy cell D1 to range D2..D12. In this instance, range D10..D12 evaluates correctly.

MAXIMUM NUMBER OF DATABASE FIELDS

I read every issue of *LOTUS* cover to cover and I rarely, if ever, find an error. But I would like to point one out in the article "Choose the Right Database Program" [December, page 64].

The article says that in *1-2-3* Releases 2.01 and 2.2 and in *Symphony* Release 1.2 you are limited to a maximum of 32 fields.

The maximum number of database fields in *1-2-3* Releases 2.01 and 2.2 and in *Symphony* Release 1.2 is 256. However, in these releases there is a 32-field limit on the Criterion and the Output ranges.

Jack McKinley
Denver, Colo.

Editor's note: *You're right. Thanks for the clarification.*

DON'T FORGET THE ALL FILE

I understand that the purpose of "Macros Can Speed Up Your Work with *1-2-3* Add-Ins" [January, page 34] was to present *1-2-3* macros for *Allways*, but if I had to continually reformat my worksheet in *Allways*, I would just copy the ALL file and then rename one of the copies to match the new WK1 file. The ALL file holds the formats and applies them to the new file or template.

Daniel Rego
Eppler, Guerin & Turner Inc.
Dallas, Tex.

Editor's note: *The point of the article was to show that you can use macros in add-ins for repetitive tasks, much the way you use them in* 1-2-3. *But you caught us using a silly example, given the ease of the technique you described.*

PCS ON THE FACTORY FLOOR

"To Control Production, Point and Shoot" [December, page 38] was quite interesting. But before anyone attempts the approach outlined in the article, a word of caution: Your office PC probably won't survive on the factory floor. Industrial-hardened versions of '286 and '386 machines, which can tolerate factory environments, are available. If this is your first attempt to use a PC on the factory floor, speak with someone knowledgeable, preferably an instrument engineer.

Howard Last, P.E.
Instrumentation and Control Systems
Great Neck, N.Y.

Author's note: *I couldn't agree with you more. In many cases an office PC will do just fine, and at lower cost. But the hardware should fit the environment. In several cases we've used rack-mounted, industrial-hardened PCs enclosed in NEMA 12 cabinets. The keyboard is oil resistant, and the monitor is enclosed in Plexiglas. Several vendors offer such PCs.*

@NPV FOR GRADUATED LEASE PAYMENTS

The worksheet presented in "Is That Truly a Capital Lease?" [August, page 62] is very helpful and accurate in determining the status of a lease that requires uniform lease payments throughout the lease term. But in my industry—supermarkets—there is a trend toward negotiating leases that require graduated lease payments. In most cases, the payments increase every five years during the lease term. This makes it hard to determine the present value. Can you suggest how I might modify the capital-lease worksheet to take into account graduated payments? I have tried repeatedly without success.

Sheila Strassner, Junior Accountant
Golub Corp.
Schenectady, N.Y.

Author's note: *Our suggestion is that you use the @NPV function, which returns the present value of a series of unequal cash flows, instead of the @PV function.*

List all the payments you'll make during the lease term in contiguous cells in one column of the worksheet. Assign the name payments *to this range. In the formula in cell B45, replace @PV(B22,B27/B44,B14*B44) with @NPV(B27/B44,payments). In the formula in cell B46, replace @PV(B22,B28/B44,B14*B44) with @NPV(B28/B44, payments).*

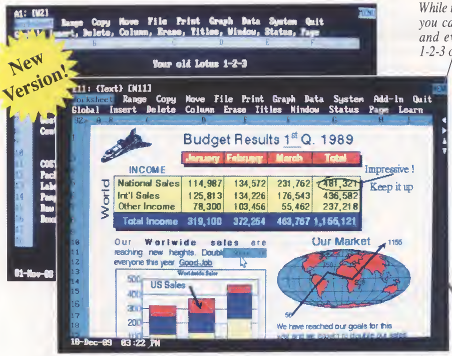
@ERR

"Order Entry Made Simple" (February): In the *asub* subroutine, shown in range B36..B41 in figure 6 on page 44, there are three {BRANCH askip} commands. These should all be changed to {BRANCH again}. The text references on page 44 to *askip* should be changed to *again*.

Letters to the editor should be sent to Letters Editor, LOTUS *Magazine, P. O. Box 9123, Cambridge, MA 02139-9123. Please include a daytime phone number. Letters may be edited for length and clarity.*

In the February Staff Letter, we asked you to send us your models. Well, we didn't expect to receive models by the boxcar. Please be patient. We will get back to you, but it may take a bit longer than two weeks.

New For 1-2-3


New Version!
A1: [W2]
Range Copy Move File Print Graph Data System Quit
Insert, Delete, Column, Erase, Titles, Window, Status, Page
Your old Lotus 1-2-3
E11: {Text} [W11]
Worksheet Range Copy Move File Print Graph Data System Add-In Quit
Global Insert Delete Column Erase Titles Window Status Page Learn
Budget Results 1st Q. 1989
INCOME
World
Impressive !
Keep it up
Our Worlwide sales are reaching new heights. Double bonus for everyone this year Good Job
Worldwide Sales
US Sales
Our Market
1155
56
We have reached our goals for this year and we expect to double our sales
01-Nov-88
18-Dec-89 03:22 PM

	January	February	March	Total
National Sales	114,987	134,572	231,762	481,321
Int'l Sales	125,813	134,226	176,543	436,582
Other Income	78,300	103,456	55,462	237,218
Total Income	319,100	372,254	463,767	1,155,121

Lotus 1-2-3 stays fully active in graphics mode with IMPRESS. 1-2-3 works just like before, only now you have your own customized 1-2-3 screen display and reports.

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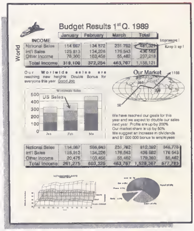

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IMPRESS from PC Publishing gives 1-2-3 true desktop publishing features that enable you to create eye-catching and persuasive worksheets.

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Customize Graphs or Forms

Graphs can be real time synchronized with your worksheet. You can also include .PIC files or Freelance files. Customize your 1-2-3 graphs with arrows, explanations, fancy titles and drawings. Draw lines, boxes, grids or even freehand to create any form or invoice from inside 1-2-3. Then fill up your forms on screen and simply print them.

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Allways and 1-2-3 Rel 2.0, 2.01, & 2.2 Compatibility

If you have Allways IMPRESS imports Allways files automatically. So you can improve them, print them sideways, or simply work on them without having to toggle to text mode. IMPRESS works with 1-2-3 Rel 2.0, 2.01, & 2.2.

Technical Requirements

IMPRESS works with: *1-2-3 release 2.0, 2.01 or 2.2, DOS 2.0 or later, CGA, EGA, VGA or Hercules (No color in CGA). Supports all graphics printers that work with 1-2-3: including Dot Matrix, Desk Jet, Laser printers (Hewlett Packard, Postscript, etc. .), Color printers IMPRESS occupies 93k RAM above 1-2-3 (uses EMS if available). Many Bitstream Fonts included with package. 1-2-3 is a registered trademark of Lotus Development Corp. Allways is a registered trademark of Funk Software.*

	Allways	IMPRESS
1-2-3 stays fully functional & interactive	No	Yes
Enhance & customize 1-2-3 screen display	No	Yes
Print sideways on all printers	No	Yes
Synchronized live graphs	No	Yes
See and work with more rows & columns on screen	No	Yes
Drawing tool box	No	Yes
Import Freelance images or graphs	No	Yes
Word processing capabilities	No	Yes
Customize graphs with arrows, frames, drawings	No	Yes
Full mouse support	No	Yes

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LET YOUR PC FIND THE BEST SOLUTION

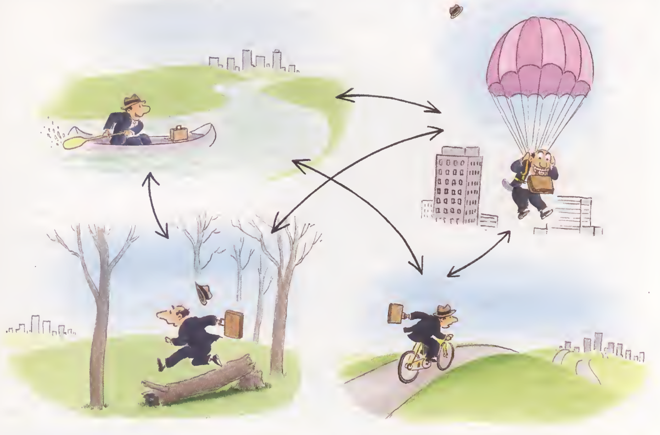
1-2-3/G is the first PC spreadsheet to include an automated optimization function.

The ability to quickly and easily play out what-if scenarios with a set of numbers has long been a focal point of spreadsheet analysis. But determining the *best* solution to a particular problem has remained an elusive and imprecise exercise for most spreadsheet users, mainly because the computer offers little help in reaching such conclusions.

That's apt to change, however, thanks in large part to *1-2-3/G*, the new version of *1-2-3* designed for OS/2's Presentation Manager environment. In addition to sporting a new look, *1-2-3/G* has new ways to help you search for optimal answers—the maximum profit, the highest yield, the lowest cost, and so on. The Solver feature uses your guidelines and its own built-in mathematical formulas to manipulate worksheet variables and come up with one or more "best" answers to a goal outlined in your model. *1-2-3/G* is the first major spreadsheet product for PCs to include an automated optimization feature.

"Solver adds a whole new dimension to spreadsheet use," says Marty Fahey, the general manager for *1-2-3/G* at Lotus Development Corp. "It's the thing that distinguishes *1-2-3/G* from everything else that's come before it."

Optimization is not new—not as a concept or a mathematical expression. Optimization models on paper, and more recently on large computer systems, have been employed for years. Basically, an optimization model is a problem-solving framework consisting of variables, equations that describe the interaction of these variables, and an objective to be maximized or minimized. Using such a framework, you can set out a goal and explore different ways to achieve it. The math behind optimization varies according to the type of variables and relationships involved. Linear programming methods are often used for additive, straight-line models, for example, while nonlinear programming is used for models with variables that can



JEFF MOORES

step up or down—such as costs that go higher or lower depending on quantity.

Some *1-2-3* users may already be using models based on linear programming. You can create an optimization model from scratch with a series of macros and formulas. "Making the Best Use of Resources" in the January issue, page 46, provides a good example. Or you can look for a commercially available template that suits your needs. You can also use a linear programming add-in such as *What'sBest*, from General Optimization (Chicago), which guides you through the process of seeking an optimal answer.

The Solver feature in *1-2-3/G* promises to expand the use of optimization models, in part because it can handle both linear and nonlinear problems. But Solver's real advance is that it makes optimization accessible to mainstream spreadsheet users who lack the expertise, time, or both, to develop models specifically geared toward finding the best answers. With *1-2-3/G* you build a worksheet model as you normally do, identify which cells are "adjustable," provide constraints, choose an optimal cell, and let Solver come up with the best answer or answers.

Easy to use

"We've worked very hard," says Fahey, "at making Solver as easy to use as possible." The accompanying box gives more details on how Solver works.

The new optimization tools reflect a growing consensus among management experts, software developers, and users that better analysis of the widening stream of data that flows from spreadsheets—among other sources—is needed to make good decisions. "We've reached a stage in the information revolution where people have a lot of data but don't know what it's telling them," asserts Jeremy Shapiro, professor of operations research and management at the Massachusetts Institute of Technology's Sloan School of Management in Cambridge, Mass. "They want the computer to help them analyze it, and that's what optimization is all about."

THE OPTIMIZATION FRAMEWORK CONSISTS OF VARIABLES, EQUATIONS, AND AN OBJECTIVE.

One common use for optimization is in the design of distribution systems, notes Shapiro. With enough raw data on how well products sell in different regions, and the costs of producing and shipping them, optimization models can help you determine the most efficient composite of warehouses and markets. Such a problem not only goes beyond basic spreadsheet what-if functions, explains Shapiro, it also outstrips our innate ability to survey the situation quickly and to offer suggestions that are reasonably close to the optimum answer. "There's really no way the human brain can intuitively come up with a solution to something like that," he says.

Optimal limits

Shapiro and others are quick to point out that there are limits to what desktop optimization tools can do. Highly complex

HOW THE 1-2-3/G SOLVER WORKS

The trouble with most what-if spreadsheet analysis is that you have to devise all of the possible scenarios. The computer just crunches the numbers. And you're never sure whether you've come up with the best answers. These are the shortcomings that the Solver feature in *1-2-3/G* addresses.

"We wanted to create a tool where you could define the results you wanted and let the computer come up with the ways to do it," says John Allyn, a member of the Solver development team.

To use Solver you first create a model. There are no special procedures for building optimization models, except to be sure that all the relevant variables are included. In a model designed to analyze profit potential, for example, you want to make certain that all of the data that has an impact on profits—all sources of revenues and costs—are accounted for. As you create the model, you should be thinking about which variables can be manipulated (adjustable cells) to achieve the desired end (the optimal cell).

The next step is to build in "constraints" that limit the range of values for the manipulated variables. Profits would be higher if production or shipping costs were zero, for instance, but that obviously isn't realistic. By putting logical two-sided formulas somewhere in your worksheet, you can stipulate that certain figures be no lower or higher than a given value. You can also cite relationships between variables, prescribing that product A always be twice the cost of product B and half the cost of product C, for example.

Once you have a model with constraints in place, you call up Solver from the Utility menu. The SOLVER window appears and you can then identify the adjustable, constraint, and optimal cells by range name or cell reference. The optimal cell can be minimized or maximized. After you've filled in the blanks, you hit the Solve button and Solver begins its work.

When it's finished, Solver displays an ANSWER window and tells you the number of solutions it found. You can then choose the optimal answer, step through the other answers, or reset the spreadsheet to its original values. Solver doesn't automatically highlight the changes made in an optimized model, but you can do so easily enough by using *1-2-3/G*'s color options to identify cells that are subject to change. If you wish, you can limit the number of answers you want Solver to find.

Solver can also produce a number of interesting reports that might enhance the value of its findings. In addition to providing a table listing the answers it uncovered, Solver offers a report explaining what it did and a report that lists, or shows in your worksheet, which cells were adjusted, optimized, or contained restraints. Another report can compare the same cells in two different answers.

For now, at least, Solver is exclusive to *1-2-3/G*. But it may be only a matter of time before other *1-2-3* users get similar problem-solving features. Lotus has not announced its intention to do so, but Allyn says "it could be added to other *1-2-3* versions." —*C. O.*

models, such as those used to reorganize an entire company or map out a sprawling system of courier routes, would overwhelm the software and hardware capabilities of PCs. Lotus, for instance, recommends that Solver be limited to worksheets with fewer than 1,000 formulas pertinent to the optimization. *What's Best* can handle as many as 16,000 variables in its optimizations, according to its vendor. Of course, anything approaching these outer limits could be intolerably slow, as well. But for typical *1-2-3* applications, either product can handle the load.

"With optimization, you can show bottom-line significance," says Mark Weston, vice president of marketing for General Optimization. "And the fact that you can back your conclusions with mathematical analysis can help you cut through some of the office bureaucracy and politics, too."

A new way of thinking

You can also combine what-if and what's-best capabilities to explore alternative courses of action. You might, for example, compare optimal manpower levels for a 10-day project cycle versus a 15-day cycle.

Still, it could take a while for spreadsheet users to warm up to optimization techniques. As easy as Solver is to use, it does require you to think more about parameters and relationships between variables as you create a model. That's probably a good thing, but it's a level of deliberation many people aren't used to in their spreadsheet work.

AN OPTIMIZATION MODEL CAN DETERMINE THE MOST EFFICIENT ALLOCATION OF NEARLY ANY COMBINATION OF RESOURCES.

"I don't know how many people will be able to frame their problems well enough to really use Solver as an optimization tool," says Jack McGrath, editor of *@Max*, a newsletter for *1-2-3* users, and author of an upcoming book on Solver. "People who already know optimization will go bonkers over this, but many others are apt to use it as a kind of simple equation solver. Optimization may come later."

Coming: optimization templates

Optimization tools that are tailored toward specific goals or industries could eliminate much of the up-front work and hasten its acceptance. Lotus's Fahey predicts there will be a robust aftermarket in customized *1-2-3/G* templates that use Solver. We're also likely to see more stand-alone optimization programs that can tap into *1-2-3* data. General Optimization recently announced *SST* (Smart Scheduling Technology), a scheduling optimizer for labor management that can work with *1-2-3*. The company says it plans to do similar programs for other areas in the near future.

General Optimization has also hinted that it will deliver a version of *What'sBest* for *1-2-3/G* that can handle large linear problems beyond Solver's capacity. But the future of optimization, concedes Weston, is in more specialized offshoots such as *SST*. "*What'sBest* is like an English setter that will scare up the game," he says, "but when you uncover a gaggle of geese, you want to find a breed of dog that's better suited to retrieving game."

Garbage in, garbage out

There may be danger in the hunt for optimal solutions, however. Mathematical algorithms may be an exact science, but the answers you get are only as reliable as the data you punch in. There are often critical factors you can't put into an optimization model, such as the vagaries of weather conditions or market fads. And even the best answers have to be interpreted carefully to be of any value in the real world.

"There's an art and a science to optimization, so there has to be a human role, as well as a computer role, in the analysis," warns MIT's Shapiro. "It's not a magical black box."

In the proper perspective, though, optimization can be a very powerful ally. For that reason, optimization features are likely to be a mainstay of future spreadsheet products—including future editions of other *1-2-3* versions. "Solver has shone a light on an area that's been in the shade for a long time," says Weston, "and that light will stay on."

—Chris O'Malley

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CIRCLE 103 ON READER SERVICE CARD

JEFF MOORES

WHO SAYS YOU CAN'T TAKE IT WITH YOU?

Removable mass storage, from hard disks to 'digital paper'

Large-capacity disks have become nearly indispensable. Applications can occupy 1 or 2 megabytes of data storage these days, while advanced operating environments, such as OS/2 or Unix, may end up hogging 3 to 5 megabytes all by themselves. And a single scanned image can take up 8 or more megabytes of disk space.

Fixed-capacity hard disks are also having trouble keeping up with an ever-increasing flood of programs and data that are exchanged via local area networks or downloaded from massive mainframe repositories.

The best of both worlds

These are some of the reasons industry analysts expect removable storage units—systems with the capacity of a hard disk and the media-exchange capabilities of a floppy—to become increasingly popular. Dataquest, a market research firm in San Jose, Calif., predicts sales of 3 million removable storage units in 1992, amounting to 9% of the market for high-capacity storage. From the 1987 tally of 1.5%, that's a compound annual growth rate of 74%.

Another key advantage of removable storage is data security, especially in financial or governmental applications, says Jim Porter, president of Disk/Trend, a Mountain View, Calif., research and consulting firm.

The popularity of large-capacity removable disks isn't news at Iomega Corp. (Roy, Utah). The company claims to have shipped more than 400,000 drives and 2.75 million removable cartridges since it pioneered the removable mass-storage market for PCs. Since 1983 Iomega's Bernoulli Box, a patented design for what is basically an overachieving floppy disk encased in a plastic cartridge, has been streamlined. It has evolved from a bulky unit with an 8-inch disk that stored 10 megabytes of data to a compact unit with a 5¼-inch disk that can store 44 megabytes. An internal single-drive Bernoulli Box, including adapter, costs $1,679; 44-megabyte cartridges cost $125 each.

Syquest Technology (Fremont, Calif.), also makes a removable hard disk with a 44-megabyte capacity. The Syquest drive has become very popular with Macintosh owners, but recently Sysgen (Milpitas, Calif.) and PLI (Fremont, Calif.) began offering IBM PC– and PS/2–compatible versions of the Syquest drive. The drive is slightly faster than the Bernoulli Box and slightly less expensive ($1,520, including the adapter), but the disk cartridges ($175 each) can't take as much physical punishment, according to industry observers.

Replaceable Winchesters

Another removable-storage option is a completely encased hard disk. This is a removable form of the familiar Winchester drive that was popularized in the IBM PC XT and PC AT. The Ad-Pac System from Tandon Corp. (Moorpark, Calif.) and the Plus Passport, from Plus Development Corp. (Milpitas, Calif.) are two examples of this type of removable drive. Both have a maximum capacity of 40 megabytes.

AN ADVANCED OPERATING SYSTEM MAY NEED 3 TO 5 MEGABYTES OF STORAGE ALL BY ITSELF.

These removable Winchesters are relatively fast, and they offer good protection against contamination of the disk's surfaces. But they're expensive because you have to buy the entire drive mechanism with each disk. The initial setup cost for

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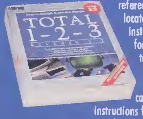

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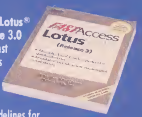

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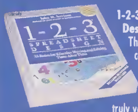

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CIRCLE 104 ON READER SERVICE CARD→

the Ad-Pack is $580, including disk receptacle, adapter, and cable; each 40-megabyte disk costs $539. For the Passport the initial setup is $648 and each disk is $795. Bottom line: If you expect to need more than one disk cartridge, the Bernoulli or Sysgen drive will probably cost you less in the long run.

MAGNETO-OPTICAL TECHNOLOGY IS THE MASS-STORAGE HOPE OF THE FUTURE.

Brier Technology (San Jose, Calif.) provides another variation on the removable-storage theme. Brier shipped the first units of its super microfloppy, the Flextra, in September. Brier's drive ($750 to $950) can cram 25 megabytes of data on what looks like a standard 3½-inch floppy disk. The difference is that special signals embedded in the disk's magnetic surface permit more precise positioning of the read/write mechanism, which allows denser recording of data. Brier expects to ship a 50-megabyte unit before the end of this year. You can expect to pay about $20 retail for a 25-megabyte disk and $35 for a 50-megabyte disk.

Graphics: a voracious storage appetite

However, if you work with a lot of graphic images, even the 40- and 50-megabyte capacities of these magnetic-storage options will be taxed. Images have exponentially greater storage requirements than the largely textual material most people deal with now. For example, an 8½-by-11-inch image scanned at a resolution of 300 dots per inch and with 256 shades of gray will occupy about 8 megabytes of disk space, says Ken Milburn, a graphics consultant in Mill Valley, Calif. Add color, and you can triple the space required.

For storage needs that run to the hundreds of megabytes, many people are looking to a technology called magneto-optical. It is the only type of rewritable optical storage now available. A single magneto-optical disk, which looks like a large audio compact disk encased in a cartridge, can store as much as 325 megabytes of data per side. The recording surface is first heated with a laser, then subjected to a magnetic field that switches bits on or off. The changed magnetism can be read by a laser as data.

Sony Corp. of America and Ricoh Corp. were the first to make these drives, but the adoption of standards will attract other vendors. Standards are currently being developed for consideration by the International Organization for Standardization and the American National Standards Institute.

Cost and speed are the biggest drawbacks of this technology. The drives cost $4,500 to $6,500 each (plus $200 to $300 per data cartridge), and they access data at about half the speed of fixed hard disks of similar capacity. Many industry analysts believe magneto-optical storage will get faster and cheaper, but not soon. "It'll be 8 to 10 years before this technology can compete with magnetic storage," says Disk/Trend's Porter. Until then, a magneto-optical drive is useful mainly in archival applications, where it competes against the storage cost and access time of paper or microfiche.

For strictly archival applications, a new option called Digital Paper may be the least expensive of all. Developed by the British firm ICI PLC, the nonrewritable storage medium is a specially coated, flexible polyester material. Iomega Corp. has been working with ICI to create a Digital Paper version of the Bernoulli Box. Iomega expects the hybrid units, which will store 1.2 gigabytes (1,200 megabytes) on a 5¼-inch cartridge, to be available before the end of this year.

By 1993, predicts Iomega, data storage on magnetic media will cost about $3 per megabyte, and magneto-optical storage will cost just 16 cents per megabyte. But the company expects that Digital Paper drives will store data for half a cent per megabyte. *—Richard Dalton*

WHERE THERE'S DOS, YOU'LL FIND A DOS SHELL

Software strategies for ducking the DOS prompt

Not long ago *XTreePro* turned into *XTreePro Gold* and *The Norton Commander* went to version 3.0. Last month Central Point Software expected to release version 6 of *PC Tools Deluxe*. And next month Lotus Development Corp. plans to unveil *Magellan* 2.0 (see the box on the next page).

It's not surprising that these and other DOS-shell programs are popular. Despite all the hoopla about newer operating environments—*Microsoft Windows*, OS/2, and a face-lifted Unix—there are more than 40 million copies of plain old DOS out there. And facing DOS's inhospitable C:> prompt is still an ordeal for millions of users. One of the main purposes of DOS shells is to simplify and shield users from DOS commands and file structures.

Like many large firms, The Mutual of Omaha Companies think it's not cost-effective to train people in DOS. Instead, the insurance company gives employees a "push-button" working environment so that they don't have to spend time getting a grip on DOS subdirectories. Mutual of Omaha has a site license for a DOS shell called *Automenu*. In every one of its new PCs, the company installs a hard-disk card containing the DOS shell, as well as its standard suite of applications.

Magee Enterprises (Norcross, Ga.), *Automenu*'s publisher, says there are more than 150,000 registered users of the program. Central Point Software (Beaverton, Oreg.) says it sold more than 700,000 copies last year of its program, *PC Tools Deluxe*. XTree Co. (San Luis Obispo, Calif.), one of the first with a tree-structured shell, claims to have sold more than a million copies of various *XTree* versions over the last five years. And because of software piracy, more than twice as many people may use these products than sales indicate, says Mark Levitt, a software analyst with International Data Corp., a market research firm in Framingham, Mass.

MICROSOFT SAYS IT PLANS TO KEEP IMPROVING DOS AND ADDING FEATURES.

Features in DOS shells vary widely. Programs range from the Spartan simplicity of *Automenu* to feature-rich products like *1dir+* from Bourbaki (Boise, Idaho), *The Norton Commander* from Peter Norton Computing (Santa Monica, Calif.), and *PC Tools Deluxe*, which provides memory management, automatic backup, disk-caching, and file encryption, as well as a bundle of *SideKick*-like applications.

With the release last year of *Lotus Magellan*, DOS shells took yet another tack. To such common shell features as simplified command execution and a tree-structured directory, *Magellan* added a sophisticated text indexing and searching technique that lets users scan their hard disks for specific files or data. But for all their differences, DOS shells have several characteristics in common:

- They all let you execute common DOS commands such as COPY, DELETE, and RENAME by selecting the commands from a menu.
- Most offer some file-management features, such as a tree- or list-structured view of your hard disk's directories and subdirectories.
- Most are memory-resident programs, which means they stand ready to buffer you from DOS whenever you exit from an application.
- All are staunchly nongraphical. They use the ASCII character set so that users don't have to invest in expensive graphics hardware.
- They are relatively inexpensive: Most are priced from $50 to $200. Logitech (Fremont, Calif.) gives away a copy of its DOS shell, *Pop-Up DOS*, with the purchase of a Logitech mouse.

They're getting more alike

Moreover, DOS shells have borrowed features from each other over the years. As a result, many of today's shells let you customize their menus, use a mouse, and view at least a few types of files (most commonly *1-2-3*, *dBase*, and ASCII) in their native formats. For example, *DOS Partner* version 1.1, a recent upgrade from EasySoft (Atlanta), displays files in several formats, including ASCII, *1-2-3*, *Quattro*, *WordPerfect*, and *XyWrite*. Some shells are adopting a "launch" feature, like the ones in *Magellan* and *The Norton Commander*, that lets you load an application by selecting one of its files from the shell.

In fact, some of the shells' more popular features have been showing up in DOS itself. DOS 4.0, for example, offers a tree-structured file directory. "We plan to keep enhancing DOS," says Mark Chestnut, Microsoft's product manager for DOS. "Over time, we'll be making DOS faster and more usable, and we'll be adding utilities."

In the bells-and-whistles department, however, it's a pretty safe bet that DOS shells will always be a step ahead.

—Richard Dalton

MAGELLAN SAILS AGAIN

Magellan 2.0, the new version of Lotus's text search and retrieval utility, is more customizable than its predecessor, says Lyra Ward, *Magellan* program manager. Scheduled for release in the second quarter, the program has more viewers, more colors, and more options. For example, the new version has a point-and-shoot feature that lets you copy from one directory to another. It also lets you adjust your keyboard speed, turn the beep on and off, and use macros to control file-group operations.

Lotus has included an ASCII text editor in *Magellan* 2.0 so that you can now edit ASCII text files from within the program. You'll also be able to see your graphics files because two new viewers let *Magellan* display *1-2-3* and *Symphony* PIC files and the DRW files of *Lotus Freelance Plus* and *Lotus Graphwriter II*.

You can expect a few more file-management tricks, as well. *Magellan* 2.0 will compress and decompress your files, back them up, compare them for differences, and identify changes that may signal a virus. The program can also restore deleted files, automatically update your index after a specified period of keyboard inactivity, and search new files without indexing them first.

—Jennifer Smith

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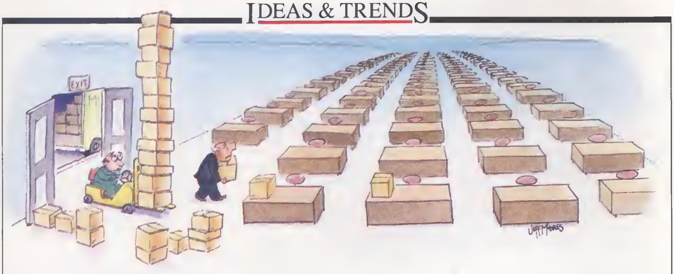

SOFTWARE UPGRADES: NO PAIN, NO GAIN

Nobody likes the process, but the benefits are worthwhile.

If you're like two out of three *LOTUS* subscribers, you've either already upgraded to *1-2-3* Release 2.2 or Release 3 or are planning to do so. In either case, you know how difficult the decision can be. "We don't really have guidelines or a standard upgrade policy," says Karen Dobeł, a senior staff analyst with Conoco, an oil subsidiary of the Du Pont Co. "We're struggling with it."

Of course, the split upgrade path Lotus Development Corp. is offering its customers has complicated matters, but *1-2-3* users aren't the only ones making tough upgrade decisions. Every software user, corporations in particular, must weigh the benefits of an upgrade against its cost, both in dollars and in ongoing training and support.

Most corporate microcomputer managers approach a software upgrade with mixed emotions. They look forward to the new features, but they dread the upgrade process. According to Mary Conti Loffredo, now a senior analyst with International Data Corp. (IDC), but previously an MIS director at Yankee Bank, "Corporations generally view upgrades as an irritating fact of life."

Smoothing the way

Upgrading software is a bit like moving to a new house: However worthwhile the end result, you don't want to do it very often. As one micro manager put it, "We'd be awfully happy if software companies came out with upgrades only about every five years." The challenge, especially for large firms, is to find a smooth way to purchase, install, support, and train their people to use a constant flood of new software.

And the more users who must upgrade, the more complex the issues. Conoco, for example, is encouraging its 4,000 *1-2-3* users to upgrade to Release 2.2 or Release 3, but Dobel says the company will continue to support Release 2.01, as well.

"Upgrading from Release 1A to Release 2.01 wasn't so bad," says Robert Green, manager of world-class business for Toro Wheel Horse, a manufacturer of lawn and garden tractors in South Bend, Ind. "But now we have a lot more PCs running *1-2-3*, so there's a lot more money and work involved in upgrading," he says.

For a mass upgrade, the sheer dollar cost can be great enough to slow down the decision-making and approval process. "Even when there are compelling reasons and employee pressure to upgrade, organizational issues tend to moderate the pace of change," says Richard Sherlund, vice president of investment research at Goldman, Sachs & Co.

At Hybritech, a genetic engineering firm in San Diego, "*1-2-3* Release 2.2 is on the corporate-approved software list," says Skip Andrews, information-center supervisor. "But if employees want Release 3, we want to make sure they really need it."

Nonetheless, most companies are willing to spend some money to upgrade. In a recent International Data Corp. study, 20% of the Fortune 2000 companies surveyed said they were willing to pay more than $150 for an upgrade. Another 13% said they would pay up to $150, and 45% more set $100 as the cutoff.

There is no denying that software upgrades are big business for vendors. At Lotus Development Corp., for example, *1-2-3* upgrades accounted for $40 million in sales last year—about 10% of all *1-2-3*-related revenues, according to Goldman, Sachs's Sherlund.

The challenge for software vendors is to update products often enough to stay competitive, but not so often as to alienate users. "We recognize that companies have to make a big effort to deal with upgrades," says Rob Perry, Lotus's senior product marketing manager for *1-2-3* Release 3. "We would never release a frivolous upgrade," he says, "but we also don't want to hold back features that add value."

On the other hand, vendors probably don't need to worry too much about user alienation. Adopting an upgrade is difficult enough; switching to another program is usually out of the question, say most corporate software managers. "It's almost impossible to switch a corporate standard," agrees Jim Fitzgerald, second vice president of distributed systems services at Unum Life Insurance Co. in Portland, Maine. "Someone else's program would have to be radically better for us to change now."

If it ain't broke, don't fix it

Most software companies time their major software releases at least a year apart. "Our customers say they need at least 12 months between releases to minimize the overhead of constantly changing things," says Nathan Harper, director of document processing at Software Publishing Corp. (SPC), in Madison, Wis. Vendors agree that more frequent up-

JEFF MOORES

grades aren't practical for anyone, although many companies bring out bug fixes or "interim" releases in between major upgrades.

For example, WordPerfect Corp. (Orem, Utah) comes out with an interim release of *WordPerfect*, its popular word-processing package, about every two or three months. But Ross Wolfley, WordPerfect's director of PC marketing, understands that adopting interim releases may not make sense for many users. "My recommendation is, 'if it ain't broke, don't fix it,' " he says. "If *WordPerfect* 5.0 is doing everything you want it to, skip the interim release."

In the process of improving their products, software vendors must sometimes add to a new release a feature that doesn't work with an older version—a situation that causes consternation for all involved. For example, all *1-2-3* Release 2.01 macros will work in *1-2-3* Releases 2.2 and 3, but because of new macro commands in the new releases, the reverse is not always true.

Conversely, upgraders to *WordPerfect* 5.0 found that their *WordPerfect* 4.2 macros didn't translate well to the new version. "That created a lot of problems," says Wolfley, "but if we'd stayed with the old format, we would have been shooting ourselves in the foot."

Not everyone upgrades

Such incompatibilities can be reason enough for some people not to upgrade. Many *WordPerfect* users still use older versions, Wolfley concedes. "My guess is that we have at least 750,000 customers working with version 4.2," he says. SPC's Harper estimates that 25% to 40% of his company's customers take advantage of upgrades. "A lot of customers either don't see a need to upgrade or don't think it's worth the cost," he says.

SOMETIMES A NEW RELEASE HAS FEATURES THAT DON'T WORK WITH AN OLDER VERSION.

Lotus won't reveal its current upgrade figures but says its annual upgrade rate

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has, in the past, hovered around 20%. Lotus, in fact, is still selling *1-2-3* Release 2.01. It will continue to do so, says a Lotus spokeswoman, "as long as people demand it." According to Lotus President and CEO Jim Manzi, sales of *1-2-3* Releases 2.01, 2.2, and 3 were about equal in the third quarter of 1989.

Even when a corporation standardizes on one vendor's spreadsheet, database, or other program, it's likely to have several versions of the program in use. The problem, says IDC's Loffredo, is that "everyone tends to get out of sync, and sometimes people can't share their files." As an MIS director, she found that the best upgrade policy is: Forego interim upgrades, make sure a major upgrade is worth the headache and the cost, and upgrade everybody at once.

The support headache

At Unum Life Insurance, Dean Lachance, head of PC software, and Jim Fitzgerald are preparing to upgrade about 1,000 *1-2-3* users to Release 2.2. and Release 3. Not everyone needs the new features, says Fitzgerald, but Unum is now supporting the entire *1-2-3* spectrum, including Release 1A. "It puts a tremendous strain on our support team," he says. "We can do a much better job of supporting two *1-2-3* releases instead of five," agrees Lachance, particularly as Unum will be able to standardize its *1-2-3* training program.

But moving 1,000 users to a new version of a software product is hardly a trivial task. Unum plans an "upgrade day," during which it will reinforce its telephone-support staff and begin distributing the packages. Even so, Fitzgerald and Lachance think it will take four months of hard work to put the new versions completely in place.

Software vendors, as well as their customers, are looking into ways to make the upgrade process less painful. For example, if you're upgrading 100 or more copies of an Ashton-Tate Corp. product, the company won't make you send in the individual serial numbers from earlier releases—a time-consuming and sometimes impossible task.

Some analysts predict that users will become increasingly apathetic toward upgrades as programs become "feature-saturated." "A high percentage of users already have software that is fine for their needs," says Goldman, Sachs's Sherlund. However, products like *1-2-3/G*—graphical versions of existing programs—may shake them up. With these programs, not only will users be learning some new tricks and features, they'll be learning a new way of interacting with the program. If you think upgrading is tough now...

—Jon Pepper

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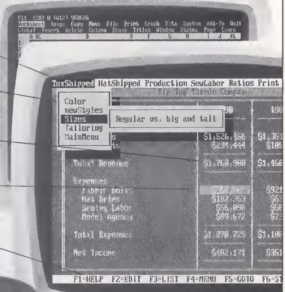

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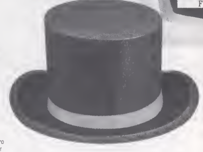
   Hat Brims                      $182,353      $63
   Sewing Labor                    $56,098      $56
   Model Agency                    $89,672      $73

 Total Expenses                 $1,278,729   $1,108

 Net Income                       $482,171     $351

F1=HELP  F2=EDIT  F3=LIST  F4=MENU  F5=GOTO  F6=ST
```



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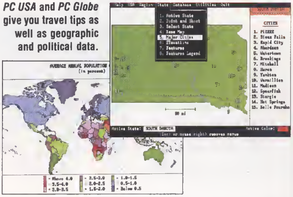
ATLASES ON DISK

PC USA and *PC Globe* 3.0 are nothing like the unwieldy and probably outdated atlases languishing in your bookcase. They are computer programs ($69.95 each, from PC Globe, Tempe, Ariz., 602-730-9000) that contain detailed maps and current demographic data for all 50 states and 177 foreign countries, respectively.



PC USA and _PC Globe_ give you travel tips as well as geographic and political data.

Once you select a state or a country—which you do via mouse or menu—you can ask for principal cities, elevations, or major geographic features. You can also request demographic, political, and historical data. If you're planning a trip, find out what clothes to take and what to see by asking for a rundown on the weather and tourist attractions. And *PC Globe* will save you trouble at the border with a list of visa requirements for foreign countries. You can even calculate the time difference and distance between any two points in the atlas by specifying latitude and longitude. If you want to compare data on states or countries, both programs will draw bar charts and color-coded maps.

The programs work with any graphics card, but the images look best with an Enhanced Graphics Adapter or a Video Graphics Array. You also need 1.3 megabytes of hard-disk space for *PC USA* and 1.5 megabytes for *PC Globe*. You can save the text-based data in ASCII format, which you can import into *1-2-3* and most word processors. And you can save the maps, graphs, and other bit-mapped information in the PCX format of *PC Paintbrush*, a paint program from ZSoft Corp. (Marietta, Ga.).

Printed atlases offer richer visual detail, but *PC USA* and *PC Globe* let you manipulate and compare current geographic and demographic data and print your own maps. Best of all, the manufacturer supplies annual updates, for a small fee, so that you can easily keep up with world changes. —*Saul D. Feldman*

BACKUP BY MODEM

Backing up your files regularly can protect you in the event of a hard-disk crash. But backups stored in your office, or even in your building, are still vulnerable to fire, flood, earthquake, and vandalism. Ideally, you should keep two sets of backups, and one of them should be far away from your office. At least two companies now make off-site data storage easy and cost-effective by letting you back up your data by modem.

For a subscription fee of $19 per month and a transmission fee as low as 5 cents per minute, Secure Data Network (Los Angeles) accepts all the data you care to transmit. The cost of backing up 2 megabytes of data per month averages about $60, says Frank Reed, the company's executive vice president. The cost includes proprietary communications software and a custom-designed, Hayes-compatible modem that can transmit up to 19,200 bits per second. The modem and software compress and encrypt your files as you transmit them to the host computer. Secure Data Network then makes at least two backups of your data and stores them at different locations. The company plans to establish an underground storage site at a retired Nike missile station in Massachusetts. If you need your backups, the company will send them to you via modem or mail them on tape, floppy, or hard disk.

Omni-Vault Corp., in Kingston, N.Y., has announced a similar service. The registration fee is $495, and most users pay about $100 per month, says Omni-Vault President Mark Squibb.

—*Larry Magid*

TRUE COLORS

A decade after *bit*, *byte*, and *CPU* appeared in the dictionary, computer jargon continues its relentless intrusion into everyday language. Now it's invading the nation's cosmetics counters. In Ultima II's new Matte+ line of eyeshadows and lipsticks, color names like Mood Indigo, Crystal Ice, Perfectly Peach, and Jungle Red are out. Micro, Disc, RAM, PC, and Printout are in.

"Yes, the consumer can guess what color Perfectly Peach is going to be," says Dawn Cheney, director of creative communications for Ultima II, "but the name doesn't truly describe the color."

Does Ultima II think that *Printout* captures the essence? Well, no, says Cheney. The names are intended to modernize a "very dated" product line and appeal to working women of the nineties. They were chosen with "reckless abandon" and bear no relation to the actual colors. That explains why there's no Big Blue—it would be too easy. Ultima II leaves it to today's computer-savvy women to figure out that Floppy is a bubblegum-pink lipstick and that Byte is a green eyeshadow.

—*Andrew Maykuth*

Ultima II's new line of makeup sports "modern" names like Micro, Disc, and RAM.

A MAGELLAN REFIT

Magellan 2.0, a new version of Lotus's text search and retrieval utility, is scheduled for release in the second quarter. It will have more viewers, more colors, and more file-management tricks than the previous version. For a detailed description of the upgrade, see "Magellan Sails Again" on page 11.

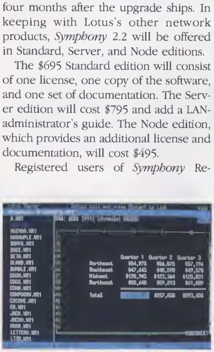
Magellan 2.0 will carry the same retail price of $195, but registered *Magellan* users may upgrade for $39. For upgrade information, call 800-872-3387. If you're not a *Magellan* user, you can get a copy of *Magellan* 2.0 for $49 if you send Lotus your copy of *The Norton Commander, The Norton Utilities, XTree Pro, XTree Pro Gold, PC Tools,* or *PC Tools Deluxe.* For details on this offer, call 617-623-6572.

SYMPHONY 2.2 UPDATE

Here's an update to our first report on *Symphony* Release 2.2 in February's @Lotus column. Lotus has announced that networked versions of *Symphony* 2.2 will be available three to four months after the upgrade ships. In keeping with Lotus's other network products, *Symphony* 2.2 will be offered in Standard, Server, and Node editions.

The $695 Standard edition will consist of one license, one copy of the software, and one set of documentation. The Server edition will cost $795 and add a LAN-administrator's guide. The Node edition, which provides an additional license and documentation, will cost $495.

Registered users of *Symphony* Releases 1.0, 1.1, 1.2, 2.0, and 2.0 Plus may upgrade for $120 through June 30; thereafter, $150. However, if you acquire *Symphony* 2.0 Plus between February 20, 1990, and 30 days after *Symphony* 2.2 ships, you can upgrade to *Symphony* 2.2 for $30. Network-upgrade pricing will be announced when the network versions are available. For more information, call 800-872-3387.



***Symphony* Release 2.2 borrows *Magellan*'s viewer technology to simplify locating and linking files.**

LOTUS UNDERWRITES SMALL-BUSINESS COURSES

Following last year's pilot program of financial-management seminars for small-business owners and operators, Lotus Development Corp. and the Association of Small Business Development Centers (ASBDC) will jointly offer the seminars in 28 states.

The seminars focus on the use of *1-2-3* for financial analysis and planning. In addition to the basics about personal-computer hardware and software, participants will learn how to interpret financial statements and how to produce cash flow projections.

"Lotus recognizes the importance of financial management to the success of small businesses," says Sue Madden, Lotus's small-business marketing manager. "Our objective is to introduce participants to basic financial-management concepts and tools that allow them to monitor their financial position and anticipate the impact of important decisions."

The seminars will be offered at small-business development centers in Alaska, Connecticut, Florida, Idaho, Iowa, Kentucky, Louisiana, Maine, Massachusetts, Michigan, Mississippi, Missouri, Nebraska, New Mexico, Nevada, North Carolina, North Dakota, Pennsylvania, Puerto Rico, Rhode Island, South Carolina, Tennessee, Texas, Utah, Virginia, Washington, West Virginia, and Wisconsin. Lotus will provide each participating center with a monetary grant, instructor training, promotional and teaching materials, and *1-2-3* Release 2.2.

The ASBDC offers training and guidance to small businesses and entrepreneurs through more than 700 offices connected with 49 state and regional centers. Call Lotus Customer Service (800-343-5414) for the telephone number of the small-business development center in your state.

ONE SOURCE FOR EUROPE

Lotus Development Corp. introduced three additions to its One Source family of databases delivered on CD-ROM (compact disk, read-only memory). *CD/Private+: U.K., CD/Corporate: U.K.,* and *CD/M&A: Europe* will provide financial information and merger and acquisition data on public and private companies in the United Kingdom and Europe.

"The 1990s will bring a ground swell of financial activity abroad as companies seek to seize the opportunities presented by [the economic unification of Europe in] 1992," says Ken Grunzweig, Lotus One Source general manager.

- *CD/Private+: U.K.* provides information (from ICC Online) covering the past 10 years on more than 100,000 private and public British companies.
- *CD/Corporate: U.K.* delivers financial and descriptive information (from Extel Financial, through the firm's U.K. Card Service) on 5,000 publicly traded British companies.
- *CD/M&A: Europe* contains information (from IDD Information Services) on more than 10,000 British and European mergers and acquisitions. Data includes company information, deal terms, advisors, and financial information dating to January 1987 on target companies.

ILLUSTRATIONS BY BETHANY GULLY

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Lotus will update all three products monthly. *CD/Private+: U.K.* is available now for an annual subscription of $15,000. *CD/Corporate: U.K.* and *CD/M&A: Europe* will be available in the second quarter for $20,000 and $15,000 per year, respectively. Discounts are available when you buy multiple subscriptions or multiple products.

One Source products come with proprietary Lotus software for screening, analysis, and reporting and are fully integrated with *1-2-3*. You need a CD-ROM reader, which is included in the subscription, and an 80286- or 80386-based IBM, Compaq, or compatible PC with 1 megabyte of RAM and DOS 3.2 or 3.3. A network version of all One Source products is available. For more information, call 800-554-5501.

ANOTHER CHANCE TO SAVE

Lotus Development Corp. has extended its *1-2-3* Perfect Fit Offer. The offer entitles customers to a $100 rebate if they purchase or upgrade to *1-2-3* Release 2.2 or 3 *and* buy *Lotus Freelance Plus* 3.0/3.01 or *Lotus Manuscript* 2.1. Originally valid through December 31, 1989, the offer now covers software bought between June 15, 1989, and December 31, 1990.

To receive a rebate, you must return to Lotus the proof-of-purchase coupon from the *Freelance Plus* or *Manuscript* package, the sales receipts, and the rebate certificate from the *1-2-3* package. All certificates marked "Offer valid through December 31, 1989" will be honored through December 31, 1990. Corporations may submit certificates in bulk with a copy of a purchase order or sales receipt.

LOTUS SHIPS @FACTORY

Last month Lotus expected to ship *Lotus @Factory*, an add-in for *1-2-3* Releases 2.01 and 2.2 that captures real-time factory-floor data to a spreadsheet.

The $795 add-in will be sold exclusively through value-added resellers and systems integrators, including Concord Communications Corp. (Marlborough, Mass.), Computrol (Ridgefield, Conn.), and Systems Integration Specialists Co. (SISCO), of Warren, Mich. For a more detailed description of *@Factory*, see @Lotus in the January issue.

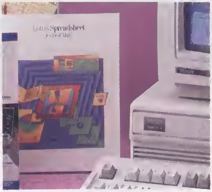
NETWORK EDITIONS OF FREELANCE PLUS

Network editions of *Freelance Plus* 3.01, Lotus's presentation-graphics package, will be available in the second quarter of this year.

Freelance Plus 3.01 Server and Node editions, like other Lotus network products, will follow Lotus networking specifications. These include features that help prevent unintended modification to shared files; LAN-administration tools that let a network administrator install, control, and manage all Lotus products on the network from one menu screen; and support for file reservation, which prevents everyone but the current user from modifying an active file.

The Standard edition, the single-user version, currently retails for $495 and consists of one license, one copy of the software, and one set of documentation. The Server edition, for installation on a network server, will cost $695 and add network-administration software, a network user guide, and a LAN-administrator's guide. The Node edition, which provides an additional license, documentation, and network user guide, will cost $395. *Freelance* 1.0 and *Freelance Plus* 2.0/2.01 users may upgrade to either the Standard or Node edition for $100. *Freelance Plus* 3.0/3.01 users who want to run the program from the network may transfer their Standard-edition license to a node.

Freelance Plus 3.01 network editions run under network operating systems compatible with DOS 3.1 and higher, including IBM PC LAN Program 1.2 and 1.3 (requires DOS 3.3), 3Com 3+Share 1.3, Novell SFT NetWare version 2.15, and Banyan Vines/3.0. To run *Freelance Plus* 3.01, you must have at least 438K of RAM available after DOS and the network software are loaded. You can reduce the memory overhead to 415K by decreasing the amount of memory allocated for charts and drawings.



Tandy will give you *Lotus Spreadsheet for DeskMate* with its TL/2 system.

TANDY-LOTUS BUNDLE

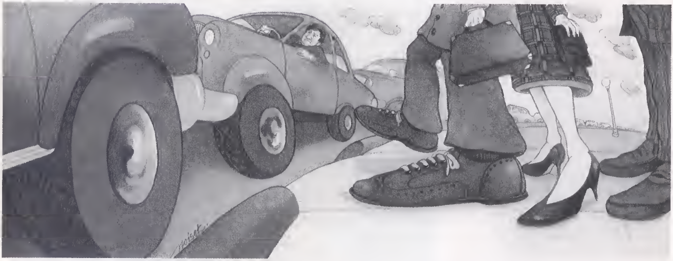
Until May 18, Tandy Corp. is offering a special bundle deal involving Lotus software on its Tandy 1000 TL/2 system. This system consists of an 8-MHz 80286-based PC, a CGA-compatible color monitor, and a 20-megabyte hard disk. Until May 18 Tandy will throw in a copy of *Lotus Spreadsheet for DeskMate*, a copy of Symantec Corp.'s *DeskMate Q&A Write*, and a Tandy mouse when you purchase this system at the special price of $1,599. Purchased separately, the hardware and software have a total retail cost of $2,418.75. The bundle offer is good at all Radio Shack stores and Tandy dealers in the United States. ■

START HERE

MAKE WAY FOR MORE DATA

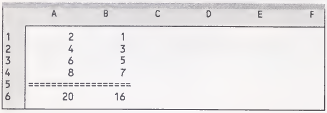
Sometimes you need a blank row or column where there isn't one.

BY DANIEL GASTEIGER



The ability to move worksheet cells or ranges is an important tool. Last month's installment of this column showed you how to use the Move command to reposition data and formulas. That article also alluded to other commands that help you to rearrange your worksheets. These commands let you insert new columns and rows among existing data and formulas. A complementary set of commands lets you remove unwanted columns and rows from the worksheet.

You may recognize the worksheet shown in the following illustration.



```
       A         B         C         D         E         F
1          2         1
2          4         3
3          6         5
4          8         7
5 ==================
6         20        16
```

This is the model used last month to illustrate the Move command. The numbers alone don't provide much information. But with a little help from some new commands, you can enter row and column labels to describe the data.

To follow this discussion, first build the model. Enter the values in range A1..B4. Then enter a backslash and an equal sign (\=) in cell A5 and copy that cell to cell B5. Enter the formula @SUM(A1..A4) in cell A6 and copy that cell to cell B6. Your worksheet should match the one shown to the left.

You probably didn't guess that this worksheet represents two-month sales totals for four products. To identify the data in columns A and B, you need to add some descriptive labels. But before you can do that, you need to establish some blank cells above and to the left of the data.

Insert a blank row in the worksheet as follows: Move the cell pointer to cell A1. Actually, any cell in row 1 will do. Then press slash and select Worksheet. The menu that appears at the top of the screen offers selections that help with overall worksheet maintenance—those Global commands we talked about back in August. You want to put a new row into the worksheet, so select Insert from the menu and then select Row.

1-2-3 prompts you for a row or range of rows to insert and offers the default range of A1..A1. You could insert several rows by expanding the range provided; but in this case, insert only one row by pressing Return. The new

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Daniel Gasteiger is a 1-2-3 *and* Symphony *consultant and a contributing editor to* LOTUS.

MICHELE NOISET

blank row appears as row 1. The original row 1 becomes row 2, and so on.

The Worksheet Insert Row command inserts a row at the current cell-pointer location or at the range address that you supply. The Worksheet Delete Row command operates the same way.

Examine the formulas that now reside in cells A7 and B7. The formula in cell A7 reads @SUM(A2..A5), and the formula in cell B7 reads @SUM(B2..B5). As you can see, when you insert a row, *1-2-3* adjusts the formulas' range references to reflect the formulas' new locations.

MAKING THE SPREAD

In the above example, the row insertion moved formulas along with their referenced data. Now consider what happens when the formulas move but the data remains in place. Move the cell pointer to cell A7 and select /Worksheet Insert Row. Suppose you want to insert a row just above the dividing line in row 6. There are two ways to indicate the appropriate insertion range. You can enter a cell address—in this case, cell A6 will do nicely—or you can point to a target cell. Let's try the pointing method.

The default insertion range, which automatically appears, is A7..A7. You can't simply press the UpArrow key to point to cell A6. In fact, if you do so, you'll expand the range reference to A7..A6. Instead, press the Escape or Backspace key to clear the range reference, and then press the UpArrow key to move the cell pointer to cell A6. When you press Return, an empty row appears at row 6.

Check the effect this process had on the formulas, now located in cells A8 and B8. Even though the formulas have moved down one row, they continue to reference ranges A2..A5 and B2..B5, respectively.

With the pointer in cell B8, now use another new command. Select /Worksheet Delete Row. Again, *1-2-3* offers a default range, B8..B8. Press the Escape or Backspace key, then point to any cell in row 6 and press Return. The empty row vanishes.

Inserting a row can have another effect on formula references and range settings. Suppose that you want to insert a row between the corner cells of a referenced range. For example, select /Worksheet Insert Row and indicate cell A4 as the insertion range.

The formulas in cells A8 and B8 continue to return 20 and 16, respectively, but their range references have expanded to accommodate the new row. The formula in cell A8 reads @SUM(A2..A6). Use the Worksheet Delete Row command to remove row 4 from the worksheet.

ABOUT ROW DELETIONS

An inserted row stretches the entire width of the worksheet. This means that information stored elsewhere on the worksheet will move just as the visible data moves. Take care when you insert rows. You don't want to disrupt a table to the left or right of your current work area.

Deleting rows presents greater perils. When you delete a row, any information that was stored in the row is gone for good. Also, any formulaic references to the row self-destruct when the row vanishes.

Recall that *1-2-3* identifies a range by its upper-left and lower-right corners. Deleting a row between the corners of a range causes the corners to converge but leaves the range reference intact. However, if you delete a row that contains a corner cell, the range becomes undefined, and any formula that contains a reference to the original range returns ERR.

The only easy way to repair a formula damaged by a row deletion is to rebuild the formula's range reference manually, so use the Worksheet Delete Row command cautiously. Never delete a row when you're not sure what lies to the left or right of the cells on your screen.

To see whether the row you want to delete contains any data, place the pointer in column A of that row. Then press End and RightArrow. If the row is blank, the pointer jumps directly to column IV, and you know that you can safely delete the row. If the row contains data, the pointer jumps to the first cell with data, and you must decide whether the contents of that cell or any adjacent cells are expendable. If you want to keep the data, don't delete the row. If you don't need the data, continue pressing End and RightArrow, making the same evaluation whenever the pointer stops at data, until you reach column IV.

NEVER DELETE A ROW WHEN YOU'RE NOT SURE WHAT LIES TO THE LEFT OR RIGHT OF THE CELLS ON YOUR SCREEN.

WHAT ABOUT COLUMNS?

Inserting and deleting worksheet columns is similar to inserting and deleting rows, except that shifts in references take place across columns rather than across rows. The Worksheet Insert Column command inserts a column at the current cell-pointer location. The Worksheet Delete Column command operates the same way.

Insert a column to the left of column A so that you have room to enter product names for the sales totals currently listed in columns A and B. Select /Worksheet Insert Column and specify cell A1 or any other cell in column A. Your worksheet now has a blank row above the data and a blank column to the left of the data. From what you've just learned, can you guess what effect this insertion had on the @SUM formulas?

You've finished the exercise on inserting and deleting columns and rows. There's no need to complete the worksheet. But since you've already inserted a column and a row, you might want to enter descriptive labels in the newly inserted cells. Label column B *Jan* and column C *Feb*. Then enter labels as follows: A2—*Treals*, A3—*Trammels*, A4—*Flemers*, A5—*Hotanks*, A7—*Total*. ■

1-2-3 MACROS

BUILD A FRONT END TO A DBASE III FILE

Learn how to use Release 3's Data External command to link your spreadsheet with database information.

MICHELE NOISET

BY NICK DELONAS

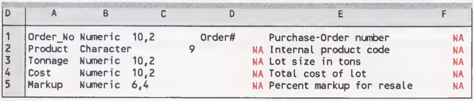
What is Release 3's most valuable new feature? One strong contender is certainly the Data External command, which uses the Lotus DataLens technology. We covered the basics of this command in the December issue ("Query External Tables with *1-2-3* Release 3," page 70). This month we'll show you some macro techniques for creating a data-entry-and-retrieval model that uses an external database table.

Release 3 uses the term "database table" instead of "database" because the external database you access may contain more than one table.

Once you can enter and retrieve external database records conveniently from within *1-2-3*, you can concentrate on expanding your model to include more data analysis. You'll then have something that no database package now offers: the analytical capabilities and convenience of the *1-2-3* spreadsheet.

The sample database driver that comes along with Release 3 provides a link with *dBase III* files. With it, you can add records to a database file that already exists. You can copy records from that file to the worksheet or to another external file. You can even create *dBase III* files. You cannot, however, delete or change existing records. Nor does the driver let you delete external files or send commands to *dBase III*.

To build this month's model, start with a blank Release 3 worksheet. Select /Worksheet Insert Sheet After and enter *3* to insert three additional sheets. Hold down the Control key and press PageUp twice to move the cell pointer to sheet D.



D	A	B	C	D	E	F
1	Order_No	Numeric	10,2	Order#	Purchase-Order number	NA
2	Product	Character	9	NA	Internal product code	NA
3	Tonnage	Numeric	10,2	NA	Lot size in tons	NA
4	Cost	Numeric	10,2	NA	Total cost of lot	NA
5	Markup	Numeric	6,4	NA	Percent markup for resale	NA

FIGURE 1

CREATING A DBASE III FILE

Before you can create an external table, you first have to set up a table definition in the worksheet. Create a table definition in sheet D, as shown in figure 1. All entries are labels—except those in cell D:C2, range D:D2..D:D5, and range D:F1..D:F5. Cell D:C2 contains a value, and ranges D:D2..D:D5 and D:F1..D:F5 contain @NA formulas. Set the widths of columns C and D to 12. Then set the width of column E to 26.

The table definition tells *1-2-3* how to set up the external data table. The first column contains the field names. In this example, the data table has five fields: *Order_No*, *Product*, *Tonnage*, *Cost*, and *Markup*.

The second column specifies the data type for each field. For example, the *Order_No* field will contain numeric data.

The third column specifies the width of the field. When you use the sample database driver, you must enter the column width for character fields as a value. You can enter the column width for numeric fields as either a value or a label. However, to specify decimal places, you must enter a label containing two numbers separated by a comma.

The first number is the total width of the field and the second number is the number of decimal places. For example, the *Cost* field has a character-width specification of 10,2. That means that the field takes the form of 9999999.99, with the decimal point counting as one character. The 6,4 specification for the *Markup* field yields a field in the form of 9.9999.

The fourth column in the table definition specifies column labels. A column label is simply an alias for a field name. The sample database driver doesn't recognize column labels, so you can set all the entries in this column to @NA. We entered the label *Order#* in cell D:D1 simply to remind us that we're using *Order#* and *Order_No* to refer to the same field in the worksheet. Such reminders can become important.

The fifth column contains field descriptions. Again, the sample driver doesn't recognize field descriptions. We entered descriptions in the worksheet simply to remind ourselves what's in the external table. When you're finished creating the external database, keep this table definition in the worksheet to save the field descriptions.

It is possible to create definition tables from existing external tables with the Data External List Fields command. But because the sample driver doesn't recognize these field descriptions, you won't be able to retrieve them later. The Data External List Fields command will simply enter *NA* for each field description.

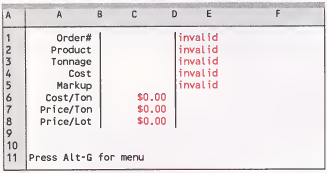
The sixth column contains field-creation strings. Some external database drivers will require these and will detail what you need to enter in the driver documentation. The sample driver doesn't require field-creation strings, so you merely need to enter @NA formulas.

Now that you've created a table definition, you're ready to create an external *dBase III* table or file. *1-2-3* uses a three-part name to identify an external table. It consists of the name of the database driver, the name of the external database, and the name of the external table. In this case the database driver is SAMPLE, the external database is the directory or path where you installed *1-2-3*, and the external table is TONNAGE.DBF.

To proceed, select /Data External Create Name. Select Sample. Accept the default directory. Enter *tonnage* as the name of the table to create. Accept the default range name for the table, *tonnage*. Then, when prompted for a table-creation string, press the Return key.

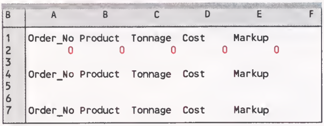
Now select Definition Use-Definition and indicate range D:A1..D:F5. Then select Go.

You've just created the *dBase III* file TONNAGE.DBF. The next step is to create a model that can use that file.



```
A      A        B     C      D     E          F
1          Order# |              | invalid
2         Product |              | invalid
3         Tonnage |              | invalid
4            Cost |              | invalid
5          Markup |              | invalid
6        Cost/Ton |        $0.00 |
7       Price/Ton |        $0.00 |
8       Price/Lot |        $0.00 |
9
10
11   Press Alt-G for menu
```

FIGURE 2



```
B      A        B        C        D        E          F
1    Order_No Product  Tonnage  Cost      Markup
2           0        0        0        0         0
3
4    Order_No Product  Tonnage  Cost      Markup
5
6
7    Order_No Product  Tonnage  Cost      Markup
```

FIGURE 3

THE DATA-ENTRY MODEL

Move the cell pointer to cell A:A1 by pressing Control-Home. Set the default column width in the A sheet to 12: Select /Worksheet Global Col-Width and enter *12*. Then set the width of columns B and D to 1 with the Worksheet Column Set-Width command.

Set cell formats as follows:

Range	Format
C1	General
C2	Other Label
C3	General
C4	Currency 2
C5	Percent 2
C6..C8	Currency 2

For example, move the cell pointer to cell C1, select /Range Format General, and press Return. To create the vertical lines in figure 2, enter ¦ in cell B1 and copy that cell to ranges B2..B8 and D1..D8.

Enter all labels in each sheet as shown in figures 2 through 4. For now, omit all text printed in red. Those are formulas that you'll enter in a moment. In figure 4 precede each entry that begins with a slash or backslash with an apostrophe. Select /Range Label Right and indicate range A:A1..A:A8 to right-align the labels in the range.

Use the Range Name Create command to assign the following range names:

Name	Range
message	A:A11
order#	A:C1
enterin	A:C1..A:C5
cost	A:C4
markup	A:C5
source	B:A2..B:E2
crit	B:A4..B:E5
crit1	B:A5
crit2	B:A5..B:E5
output	B:A7..B:E7
output1	B:A8..B:E8
labels	B:B1..B:E1
rtabl	C:B1..C:C2
tabl	C:B2..C:C5

For example, to assign the range name *message,* select /Range Name Create, enter *message*, and then enter *A:A11*.

For the macro's initial run, you must set up the Data Query ranges. Select /Data Query Input and enter *tonnage.* Select Criteria and enter *crit.* Select Output and enter *output.* Then select Quit.

Now press the GOTO key and enter *C:A7* to move the cell pointer to cell C:A7. Use the Range Name Labels Right command to assign the labels in range C:A7..C:A41 as range names for the adjacent cells in column B of sheet C.

Enter the following formulas in the specified cells:

Cell	Formula
A:E1	@IF(@CELL("type",order#) = "v","valid","invalid")
A:E2	@IF(@CELL("type",C2..C2) = "l","valid","invalid")
A:E3	@IF(@CELL("type",C3..C3) = "v","valid","invalid")
A:E4	@IF(@CELL("type",cost) = "v","valid","invalid")
A:E5	@IF(C5<10#AND#C5>=0#AND#@CELL ("type",C5..C5)="v","valid","invalid")
A:C6	@IF(C3,C4/C3,0)
A:C7	+C6*(1+C5)
A:C8	+C7*C3
B:A2	+A:C1
B:B2	+A:C2
B:C2	+A:C3
B:D2	+A:C4
B:E2	+A:C5

Use the Range Unprotect command to unprotect range *enterin.*

To run the macro, hold down the MACRO key (Alt on most computers) and press G. The macro moves the cell pointer to cell C1, suppresses display of the border, and displays a menu in the control panel. You might think that the screen would look better if we included a {PANELOFF clear} command in the macro to clear the panel. Unfortunately, the {PANELOFF clear} command doesn't work when DataLens is active.

To add a record to the database, select Enter from the menu. The macro enters the next number in the cell named *order#.* Since you're entering the first order, the macro enters *1.* If you wish, enter a different number. The macro always prompts you for a number one higher than the last order number you entered.

Change the order number to *1000* and press Return. Enter *D51* as the product code. Enter *16* for tonnage. Enter *51000* for the cost. Enter *21%* for markup. Then press F10 to enter the record into the *dBase III* file.

Select Enter again. Accept 1,001 as the order number. Enter *G23* as the product code, *14* for tonnage, *31500* for cost, and *11%* for markup. Press the F10 key to enter the record.

Now select Retrieve. Enter *1000.* Press the F10 key to retrieve the record for order number 1,000.

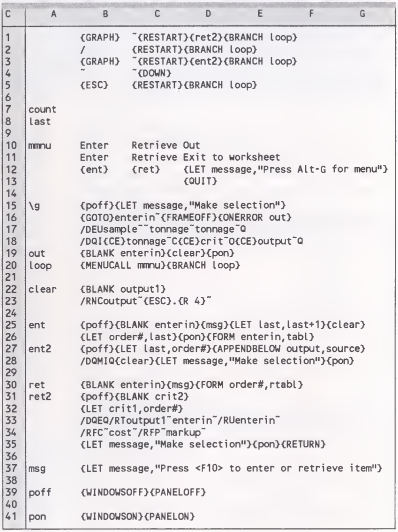
Selecting Out halts macro processing and returns you to Ready mode.

Here's how it works:

{poff}{LET message,"Make selection"} calls the *poff* routine that freezes the screen display. The macro then enters *Make selection* in the cell named *message.*

{GOTO}enterin~{FRAMEOFF}{ONERROR out} moves the cell pointer to the upper-left corner of the *enterin* range. The macro suppresses the display of the worksheet frame. Then it tells *1-2-3* to branch control to the *out* routine if there is an error. We include the {ONERROR} command to handle the error that occurs when the macro tries to reassign the external table named *tonnage* to the range name *tonnage.* As an alternative to this method, you could have the macro use a formula, such as @ISERR(@DCOUNT(tonnage,"ORDER_NO",*crit*)), to check to see if *1-2-3* is using *tonnage*, before issuing the Data External Use command.

/DEUsample~~tonnage~tonnage~Q tells *1-2-3* to



```
C   A        B        C        D        E        F        G

1            {GRAPH}  ~{RESTART}{ret2}{BRANCH loop}
2            /        {RESTART}{BRANCH loop}
3            {GRAPH}  ~{RESTART}{ent2}{BRANCH loop}
4            ~        ~{DOWN}
5            {ESC}    {RESTART}{BRANCH loop}
6
7   count
8   last
9
10  mmnu     Enter    Retrieve Out
11           Enter    Retrieve Exit to worksheet
12           {ent}    {ret}    {LET message,"Press Alt-G for menu"}
13                             {QUIT}
14
15  \g       {poff}{LET message,"Make selection"}
16           {GOTO}enterin~{FRAMEOFF}{ONERROR out}
17           /DEUsample~~tonnage~tonnage~Q
18           /DQI{CE}tonnage~C{CE}crit~O{CE}output~Q
19  out      {BLANK enterin}{clear}{pon}
20  loop     {MENUCALL mmnu}{BRANCH loop}
21
22  clear    {BLANK output1}
23           /RNCoutput~{ESC}.{R 4}~
24
25  ent      {poff}{BLANK enterin}{msg}{LET last,last+1}{clear}
26           {LET order#,last}{pon}{FORM enterin,tabl}
27  ent2     {poff}{LET last,order#}{APPENDBELOW output,source}
28           /DQMIQ{clear}{LET message,"Make selection"}{pon}
29
30  ret      {BLANK enterin}{msg}{FORM order#,rtabl}
31  ret2     {poff}{BLANK crit2}
32           {LET crit1,order#}
33           /DQEQ/RToutput1~enterin~/RUenterin~
34           /RFC~cost~/RFP~markup~
35           {LET message,"Make selection"}{pon}{RETURN}
36
37  msg      {LET message,"Press <F10> to enter or retrieve item"}
38
39  poff     {WINDOWSOFF}{PANELOFF}
40
41  pon      {WINDOWSON}{PANELON}
```

FIGURE 4

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use the TONNAGE.DBF file with SAMPLE. This saves you from having to invoke DataLens manually each time you retrieve the file.

/DQI{CE}tonnage~C{CE}crit~O{CE}output~Q selects the Data Query command and assigns *tonnage* as the Input range, *crit* as the Criterion range, and *output* as the Output range. The macro then selects Quit to exit the Data Query menu.

{BLANK enterin}{clear}{pon} erases the contents of the cell named *enterin* and then calls the *clear* and the *pon* routines. The *clear* routine erases the contents of range *output1* and reassigns the range *output* to range B:A7..B:E7. This prepares *1-2-3* for the Data Query Extract command in the *ret* routine. The *pon* routine reactivates the screen for updating with a {WINDOWSON} and a {PANELON} command.

{MENUCALL mmnu}{BRANCH loop} calls the menu instructions that are in and next to the cell named *mmnu*. When the macro issues the {MENUCALL} command, *1-2-3* assumes that the labels in the range C:B10..C:D10 are instructions for creating custom menu commands. It further assumes that the labels in range C:B11..C:D11 are instructions for creating custom menu descriptions. The macro displays the custom menu commands and the custom menu description of the highlighted command. From the user's point of view, the custom menu operates exactly the same way *1-2-3*'s own menu system works. When the user highlights a particular custom command, control passes to the macro two cells down from the corresponding instruction in range C:B10..C:D10. For example, if you select Enter, control goes to the macro command in cell C:B12. After you select either Enter or Retrieve and *1-2-3* runs the associated macro routine, control passes to the *loop* routine. So the macro effectively repeats the {MENUCALL} command until you select Out from the custom menu prompt.

When you select Enter from the menu, *1-2-3* runs the *ent* routine. Here's how it works:

{poff}{BLANK enterin}{msg}{LET last,last+1}{clear} calls the *poff* routine that freezes the screen display. The macro erases the contents of range *enterin*. Then it calls the *msg* routine, which enters *Press <F10> to enter or retrieve item* in the cell named *message*. The macro then increases the value in the cell named *last* by 1 and calls the *clear* routine.

{LET order#,last}{pon}{FORM enterin,tabl} copies the value in the cell named *last* to the cell named *order#*. The macro calls the *pon* routine to resume screen updating, then issues a {FORM} command to accept data entry. The first argument in the {FORM} command identifies the Form-Input range. Very much like the Range Input command, the {FORM} command suspends macro processing so that you can enter and edit data in the unprotected cells in this range. The second argument identifies the Call-Table range—in this case, *tabl*. This range consists of two columns. Each cell in the first column contains the macro name of a key on the keyboard. If you press any of the listed keys during data entry, *1-2-3* will run the macro instructions in the cell adjacent to the cell containing the key name. So, for example, if you press the Return key, *1-2-3* processes the macro instructions in cell C:C4.

{poff}{LET last,order#}{APPENDBELOW output,source} calls *poff* to freeze the screen display and copies the value in *order#* to *last*. The macro then uses the {APPENDBELOW} command to add the record you just entered to the *output* range. The *source* range simply contains formulas that return your record in a horizontal orientation.

/DQMIQ{clear}{LET message,"Make selection"}{pon} adds the new record to the *dBase III* file and returns to Ready mode by using the Data Query Modify Insert Quit command. The macro calls the clear routine and enters *Make selection* in the cell named *message*. The macro then calls the *pon* routine to reactivate the screen display.

If you select Retrieve from the macro menu, *1-2-3* runs the *ret* routine. Here's how that works:

{BLANK enterin}{msg}{FORM order#,rtabl} erases the contents of the range *enterin* and calls the routine *msg*. The macro then uses the {FORM} command to accept the order number of the record you want to retrieve.

{poff}{BLANK crit2} calls *poff* to freeze the screen display and erases the contents of the *crit2* range.

{LET crit1,order#} copies the value in *order#* to *crit1*.

/DQEQ/RToutput1~enterin~/RUenterin~ extracts the desired record to the *output* range and copies that record to the *enterin* range using the Range Transpose command. The macro then unprotects all the cells in the *enterin* range since the Range Transpose command changed them to protected cells.

Note that this routine cannot handle files where more than one record share the same order number. You might want to include an error-checking procedure for your own applications. Nor does the macro tell the user if *1-2-3* cannot find the order number. Instead, the macro simply erases the *enterin* range. You could include a routine that would flash a message like *Record not found.* You might use an @DCOUNT formula to check for a particular record.

/RFC~cost~/RFP~markup~ resets the formats in the cells named *cost* and *markup* to Currency 2 and Percent 2, respectively.

{LET message,"Make selection"}{pon}{RETURN} enters *Make selection* in the cell named *message* and calls the *pon* routine to reactivate the screen display. The macro then returns control to the calling routine. ■

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If you have questions about macros, send them to us. If you have a favorite macro technique, we'd like to see it. If we use your letter in a column, we'll send you $25 for a question and $50 for a technique. Write to: Macros Editor, LOTUS *Magazine, P.O. Box 9123, Cambridge, MA 02139–9123.*

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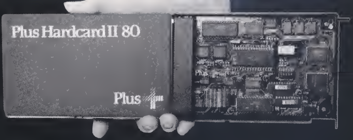

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STOCK-ANALYSIS WORKSHEET

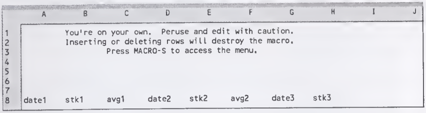
Can't decide when to buy or sell? Plotting a stock's closing values against a 30-day floating average can help.

BY DANIEL GASTEIGER

There is a theory stating that a stock's average value during a 30-day period represents a baseline that the stock price crosses from time to time. Conventional wisdom suggests that when the stock price drops below the average, chances are the price will rise again to the average in the near future. Similarly, when the price rises above the average, there's a good chance it will soon see a downturn. If the theory is correct, you'll want to buy when the price drops below the average and sell when the price rises above it. This model helps you spot those times when it might be advantageous to buy or sell a particular stock.

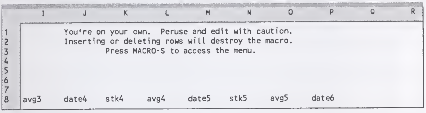
Be aware, however, that making an investment decision isn't simple. So many factors affect a stock's performance that no prudent investor should rely on a single measure. Instead, you'll want to use this template along with other tools that help you make decisions to buy or sell. Have fun with the model. But realize that *LOTUS* magazine makes no claim regarding the validity of this approach to the analysis of stocks and is not responsible for the results of any of its readers' activities involving the stock market.

Daniel Gasteiger is a 1-2-3 *and* Symphony *consultant and a contributing editor to* LOTUS.



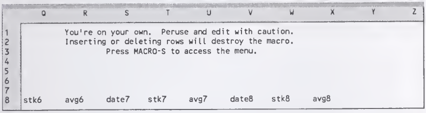
```
       A         B         C         D         E         F         G         H         I         J
1                You're on your own.  Peruse and edit with caution.
2                Inserting or deleting rows will destroy the macro.
3                          Press MACRO-S to access the menu.
4
5
6
7
8    date1     stk1      avg1      date2     stk2      avg2      date3     stk3
```

FIGURE 1



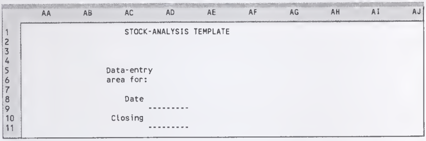
```
       I         J         K         L         M         N         O         P         Q         R
1                You're on your own.  Peruse and edit with caution.
2                Inserting or deleting rows will destroy the macro.
3                          Press MACRO-S to access the menu.
4
5
6
7
8    avg3      date4     stk4      avg4      date5     stk5      avg5      date6
```

FIGURE 2



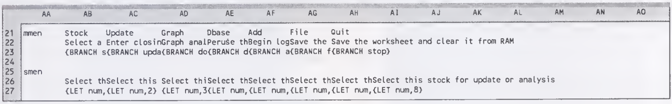
```
       Q         R         S         T         U         V         W         X         Y         Z
1                You're on your own.  Peruse and edit with caution.
2                Inserting or deleting rows will destroy the macro.
3                          Press MACRO-S to access the menu.
4
5
6
7
8    stk6      avg6      date7     stk7      avg7      date8     stk8      avg8
```

FIGURE 3



```
       AA        AB        AC        AD        AE        AF        AG        AH        AI        AJ
1                              STOCK-ANALYSIS TEMPLATE
2
3
4
5                         Data-entry
6                         area for:
7
8                              Date
9                                   ---------
10                          Closing
11                                  ---------
```

FIGURE 4

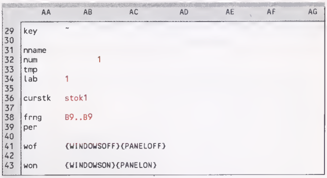


```
       AA        AB        AC        AD        AE        AF        AG        AH        AI        AJ        AK        AL        AM        AN        AO
21  mmen      Stock     Update      Graph     Dbase     Add       File      Quit
22            Select a Enter closinGraph analPeruse thBegin logSave the Save the worksheet and clear it from RAM
23            {BRANCH s{BRANCH upda{BRANCH do{BRANCH d{BRANCH a{BRANCH f{BRANCH stop}
24
25  smen
26            Select thSelect this Select thiSelect thSelect thSelect thSelect thSelect this stock for update or analysis
27            {LET num,{LET num,2} {LET num,3{LET num,{LET num,{LET num,{LET num,{LET num,8}
```

FIGURE 5

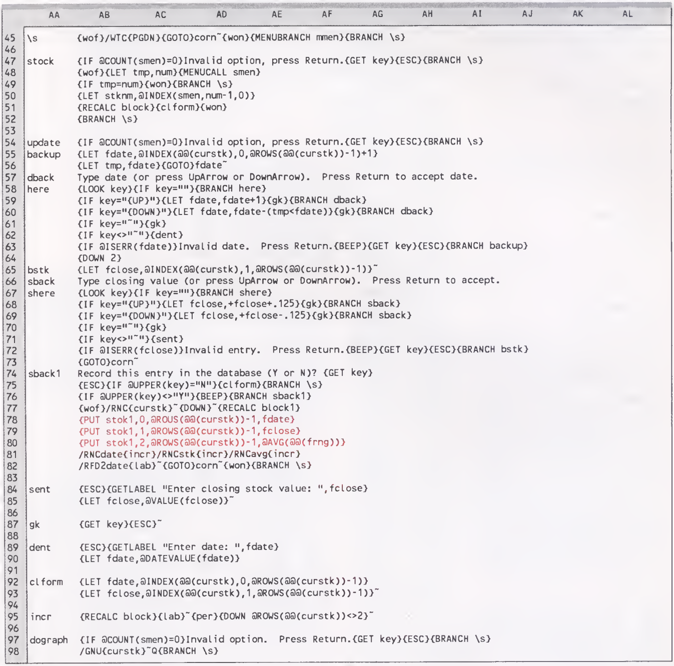
Once you build the stock-analysis model, you'll find that using it is almost self-explanatory. In fact, menus and prompts built into the model guide you in using the template. However, there are a few points to note.

There are several menu selections that are invalid until you use the Add option to create a stock record. This option lets you enter the name of a stock whose performance you want to analyze. After you create a stock record, the stock's name appears on a menu that you access via the Stock selection on the template's main menu. The Add option becomes invalid after you create eight stock records, which is the maximum number of stocks that



```
          AA        AB        AC         AD        AE        AF        AG
29  key       ~
30
31  nname
32  num                 1
33  tmp
34  lab       1
35
36  curstk    stok1
37
38  frng      B9..B9
39  per
40
41  wof       {WINDOWSOFF}{PANELOFF}
42
43  won       {WINDOWSON}{PANELON}
```

FIGURE 6



```
      AA      AB        AC          AD        AE        AF        AG        AH        AI        AJ        AK        AL

45  \s        {wof}/WTC{PGDN}{GOTO}corn~{won}{MENUBRANCH mmen}{BRANCH \s}
46
47  stock     {IF @COUNT(smen)=0}Invalid option, press Return.{GET key}{ESC}{BRANCH \s}
48            {wof}{LET tmp,num}{MENUCALL smen}
49            {IF tmp=num}{won}{BRANCH \s}
50            {LET stknm,@INDEX(smen,num-1,0)}
51            {RECALC block}{clform}{won}
52            {BRANCH \s}
53
54  update    {IF @COUNT(smen)=0}Invalid option, press Return.{GET key}{ESC}{BRANCH \s}
55  backup    {LET fdate,@INDEX(@@(curstk),0,@ROWS(@@(curstk))-1)+1}
56            {LET tmp,fdate}{GOTO}fdate~
57  dback     Type date (or press UpArrow or DownArrow).  Press Return to accept date.
58  here      {LOOK key}{IF key=""}{BRANCH here}
59            {IF key="{UP}"}{LET fdate,fdate+1}{gk}{BRANCH dback}
60            {IF key="{DOWN}"}{LET fdate,fdate-(tmp<fdate)}{gk}{BRANCH dback}
61            {IF key="~"}{gk}
62            {IF key<>"~"}{dent}
63            {IF @ISERR(fdate)}Invalid date.  Press Return.{BEEP}{GET key}{ESC}{BRANCH backup}
64            {DOWN 2}
65  bstk      {LET fclose,@INDEX(@@(curstk),1,@ROWS(@@(curstk))-1)}~
66  sback     Type closing value (or press UpArrow or DownArrow).  Press Return to accept.
67  shere     {LOOK key}{IF key=""}{BRANCH shere}
68            {IF key="{UP}"}{LET fclose,+fclose+.125}{gk}{BRANCH sback}
69            {IF key="{DOWN}"}{LET fclose,+fclose-.125}{gk}{BRANCH sback}
70            {IF key="~"}{gk}
71            {IF key<>"~"}{sent}
72            {IF @ISERR(fclose)}Invalid entry.  Press Return.{BEEP}{GET key}{ESC}{BRANCH bstk}
73            {GOTO}corn~
74  sback1    Record this entry in the database (Y or N)? {GET key}
75            {ESC}{IF @UPPER(key)="N"}{clform}{BRANCH \s}
76            {IF @UPPER(key)<>"Y"}{BEEP}{BRANCH sback1}
77            {wof}/RNC{curstk}~{DOWN}~{RECALC block1}
78            {PUT stok1,0,@ROUS(@@(curstk))-1,fdate}
79            {PUT stok1,1,@ROWS(@@(curstk))-1,fclose}
80            {PUT stok1,2,@ROWS(@@(curstk))-1,@AVG(@@(frng))}
81            /RNCdate{incr}/RNCstk{incr}/RNCavg{incr}
82            /RFD2date{lab}~{GOTO}corn~{won}{BRANCH \s}
83
84  sent      {ESC}{GETLABEL "Enter closing stock value: ",fclose}
85            {LET fclose,@VALUE(fclose)}~
86
87  gk        {GET key}{ESC}~
88
89  dent      {ESC}{GETLABEL "Enter date: ",fdate}
90            {LET fdate,@DATEVALUE(fdate)}
91
92  clform    {LET fdate,@INDEX(@@(curstk),0,@ROWS(@@(curstk))-1)}
93            {LET fclose,@INDEX(@@(curstk),1,@ROWS(@@(curstk))-1)}~
94
95  incr      {RECALC block}{lab}~{per}{DOWN @ROWS(@@(curstk))<>2}~
96
97  dograph   {IF @COUNT(smen)=0}Invalid option.  Press Return.{GET key}{ESC}{BRANCH \s}
98            /GNU{curstk}~Q{BRANCH \s}
```

FIGURE 7

you will be able to analyze while using this model.

A stock's name that you select from the Stock menu appears on the data-entry form until you select a different stock's name. The data-entry form shows the most recent entry for the selected stock. If you have two or more names of stocks that begin with the same letter, you must move the cursor to the desired stock's name and press Return to select it.

When you select Update, the data-entry form becomes active and you can enter the latest closing information for the selected stock. The first time you select Update for a particular stock, you must type a complete date in one of the *1-2-3* date formats to replace the one that appears in the entry blank. You also must type the stock's closing value to replace the label in the second entry blank.

For all succeeding updates that you perform on a particular stock, the macro offers a default date, which is one day later than the latest date you've recorded. If you want to use a later date, simply press the UpArrow key. Doing so lets you easily skip over weekends and holidays. If you mistakenly specify a date that's too late, use the DownArrow key to specify an earlier date. The DownArrow key,

HOW TO SET UP THE STOCK-ANALYSIS WORKSHEET

1. Releases

The model runs in *1-2-3* Releases 2.01, 2.2, and 3.0.

2. Individual column widths

Column	Width
AC	12
AD	10

For example, to set the width of column AC, place the cell pointer in column AC, select /Worksheet Column Set-Width, and enter 12.

3. Cell formats

Format	Range
Date 1	AD8

Select /Range Format Date 1 and indicate cell AD8.

4. Cell protection

Disable protection for cells AD8 and AD10.

For example, select /Range Unprotect and indicate cell AD8.

5. Labels

Enter all labels shown in all figures, omitting for now entries printed in red. Enter the labels shown in cells B1, B2, and C3 of figure 1. Then copy range B1..C3 to cells J1 and R1. Begin the entry in cell AC1 by typing four spaces. Begin the entries in cells AC8 and AC10 by typing a quotation mark. To create rows of dashes, enter \–. Remember to precede all labels that start with \ or / with an apostrophe. The following list reveals the contents of cells whose labels overlap in the illustrations:

Cell	Label
AB22	Select a stock for update or analysis.
AC22	Enter closing value(s) for selected stock.
AD22	Graph analysis of selected stock.
AE22	Peruse the database.
AF22	Begin log for a new stock and add to the Stock menu.
AG22	Save the worksheet.
AH22	Save the worksheet and clear it from RAM.
AB23	{BRANCH stock}
AC23	{BRANCH update}
AD23	{BRANCH dograph}
AE23	{BRANCH dbase}
AF23	{BRANCH add}
AG23	{BRANCH file}
AH23	{BRANCH stop}
AB26	Select this stock for update or analysis.

Copy cell AB26 to range AC26..AI26.

AB27	{LET num,1}	**AF27**	{LET num,5}
AC27	{LET num,2}	**AG27**	{LET num,6}
AD27	{LET num,3}	**AH27**	{LET num,7}
AE27	{LET num,4}	**AI27**	{LET num,8}

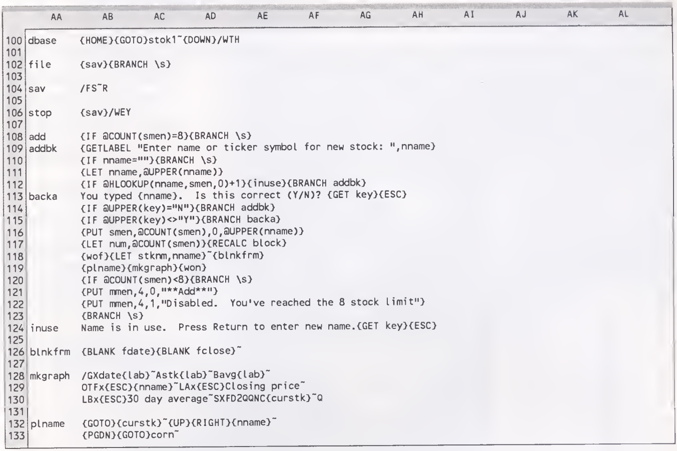
6. Range names

Name	Range	Name	Range
block	AB29..AB39	*stok2*	D8..F8
block1	AB78..AB80	*stok3*	G8..I8
mmen	AB21..AH22	*stok4*	J8..L8
smen	AB25..AI25	*stok5*	M8..O8
corn	AA1	*stok6*	P8..R8
fclose	AD10	*stok7*	S8..U8
fdate	AD8	*stok8*	V8..X8
stknm	AD6	\0	AB45
stok1	A8..C8		
add	AB108	*frng*	AB38
addbk	AB109	*gk*	AB87
backa	AB113	*here*	AB58
backup	AB55	*incr*	AB95
blnkfrm	AB126	*inuse*	AB124
bstk	AB65	*key*	AB29
clform	AB92	*lab*	AB34
curstk	AB36	*mkgraph*	AB128
dback	AB57	*nname*	AB31
dbase	AB100	*num*	AB32
dent	AB89	*per*	AB39
dograph	AB97	*plname*	AB132
file	AB102	*sav*	AB104
sback	AB66	*tmp*	AB33
sback1	AB74	*update*	AB54
sent	AB84	*wof*	AB41
shere	AB67	*won*	AB43
stock	AB47	\s	AB45
stop	AB106		
avg1	C9	*date5*	M9
avg2	F9	*date6*	P9
avg3	I9	*date7*	S9
avg4	L9	*date8*	V9
avg5	O9	*stk1*	B9
avg6	R9	*stk2*	E9
avg7	U9	*stk3*	H9
avg8	X9	*stk4*	K9
date1	A9	*stk5*	N9
date2	D9	*stk6*	Q9
date3	G9	*stk7*	T9
date4	J9	*stk8*	W9

To assign each name in the first group, select /Range Name Create, enter the name, then indicate the range. To assign the second group of names, select /Range Name Labels Right and indicate range AA29..AA132. To assign the third group of names, select /Range Name Labels Down and indicate range A8..X8.

7. Formulas

Cell	Formula
AB34	@STRING(num,0)
AB36	+"stok"&lab
AB38	@MID("BEHKNQTW",num–1,1)&@STRING(@MAX(9,@ROWS(@@(curstk))+8–30),0)&".."&@MID("BEHKNQTW",num–1,1)&@STRING(@ROWS(@@(curstk))+8,0)
AB39	@IF(@ROWS(@@(curstk))=3,".","")
AB78	+"{PUT "&curstk&",0,@ROWS(@@(curstk))–1,fdate}"
AB79	+"{PUT "&curstk&",1,@ROWS(@@(curstk))–1,fclose}"
AB80	+"{PUT "&curstk&",2,@ROWS(@@(curstk))–1,@AVG(@@(frng))}"



```
        AA         AB         AC         AD         AE         AF         AG         AH         AI         AJ         AK         AL

100 dbase     {HOME}{GOTO}stok1~{DOWN}/WTH
101
102 file      {sav}{BRANCH \s}
103
104 sav       /FS~R
105
106 stop      {sav}/WEY
107
108 add       {IF @COUNT(smen)=8}{BRANCH \s}
109 addbk     {GETLABEL "Enter name or ticker symbol for new stock: ",nname}
110           {IF nname=""}{BRANCH \s}
111           {LET nname,@UPPER(nname)}
112           {IF @HLOOKUP(nname,smen,0)+1}{inuse}{BRANCH addbk}
113 backa     You typed {nname}.  Is this correct (Y/N)? {GET key}{ESC}
114           {IF @UPPER(key)="N"}{BRANCH addbk}
115           {IF @UPPER(key)<>"Y"}{BRANCH backa}
116           {PUT smen,@COUNT(smen),0,@UPPER(nname)}
117           {LET num,@COUNT(smen)}{RECALC block}
118           {wof}{LET stknm,nname}~{blnkfrm}
119           {plname}{mkgraph}{won}
120           {IF @COUNT(smen)<8}{BRANCH \s}
121           {PUT mmen,4,0,"**Add**"}
122           {PUT mmen,4,1,"Disabled.  You've reached the 8 stock limit"}
123           {BRANCH \s}
124 inuse     Name is in use.  Press Return to enter new name.{GET key}{ESC}
125
126 blnkfrm   {BLANK fdate}{BLANK fclose}~
127
128 mkgraph   /GXdate{lab}~Astk{lab}~Bavg{lab}~
129           OTFx{ESC}{nname}~LAx{ESC}Closing price~
130           LBx{ESC}30 day average~SXFD2QQNC{curstk}~Q
131
132 plname    {GOTO}{curstk}~{UP}{RIGHT}{nname}~
133           {PGDN}{GOTO}corn~
```

FIGURE 8

however, doesn't allow you to specify a date that's earlier than the default date.

The macro also offers a default closing stock value, which is simply the closing value from the previous entry. You can type a new value, or you can press the UpArrow or DownArrow key to increase or decrease the default by intervals of ⅛ point. Should you choose to type a value, note that an entry such as 3 ⅝—an entry that has a space after the whole number—is valid. The macro converts it to 3.625.

For the first 30 days that you enter stock closings, the stock's graph is based on all the entries made to date. After the 30th day, the graph's floating average represents the past 30 days' closing prices. Buying and selling based on less than one month's worth of data is, perhaps, more risky than making decisions based on a full month. And be aware that all the data you enter is worthless if there are gaps in the 30-day block of entries. So always bring the template up to date before entering the current day's closing prices.

If you plan to enter a lot of data in the model, the X axis of the graph will become crowded. To avoid this problem, before you enter any data in the model, you may want to set a skip factor and display only every fifth or tenth date. To do so, you'll need to edit cell AB130 to read as follows:

```
LBx{ESC}30 day average~SXFD2QSSn~
   QNC{curstk}~Q
```

In this label, *n* is the skip factor. For example, to display every fifth date on the X axis, you'll need to replace *n* with 5.

Finally, basing the analysis on a 30-day average is arbitrary. A 50-day or 100-day average would fluctuate more slowly than a 30-day average and might not keep up with a stock whose value is constantly increasing or decreasing. Thus you might never see a good "buy" or "sell" opportunity. Conversely, a 10-day or 15-day average fluctuates rapidly along with the stock's value. Making a decision based on that kind of data, you might buy one week, sell the next, buy the next, and so on.

To change the interval on which the model bases its floating averages, you need to change only two entries. Edit the entry in cell AB130 so that it looks like the following label:

```
LBx{ESC}n day average~SXFD2QQNC
   {curstk}~Q
```

In this label, *n* represents the number of rows to average. Also edit the formula in cell AB38. The formula contains the expression $+8-30$. Change that to read $+8-n$, where n is the number of rows to average. ■

FOR DEVELOPERS

THE SYSTEMS-DEVELOPMENT LIFE CYCLE

For those really important projects, discover the power of prototypes.

BY NICK DELONAS

As personal computers become more powerful and ubiquitous, the spreadsheet program becomes increasingly essential to success in business. And as the importance of spreadsheet processing grows, so does the importance of a good spreadsheet programmer. You may find that the models you're developing now are larger and more complex than they used to be. And you may also find that management is paying more attention to them. By bringing a high level of professionalism to your developmental work, you can earn the respect of managers, clients, and MIS departments.

One way to increase your professionalism and customer satisfaction is to follow what MIS people call a formal systems-development life cycle. Systems analysts, designers, and programmers have long followed formal life cycles in order to create large-scale computer systems. Such life cycles follow specific phases, or steps.

Developing systems in *1-2-3* or *Symphony* is so much easier than developing a system in Cobol or Fortran that following all phases of a traditional life cycle doesn't make much sense. Traditional life cycles include steps to lessen some of the problems inherent in development in a more difficult language. Thus, if we change the traditional life cycle by removing certain steps and by developing a prototype, we give the spreadsheet developer a legitimate and sensible developmental framework.

We chose, as a starting point, a systems-development life cycle suggested by Jeffrey L. Whitten, Lonnie D. Bentley, and Thomas I. M. Ho in their book *Systems Analysis and Design Methods* (Times Mirror/Mosby College Publishing, 1986). Our modified life cycle has five phases: the feasibility survey, a study of the current system, evaluation, the building of a prototype, and feedback, modification, and completion.

FEASIBILITY SURVEY

In the survey phase, you take a look at a problem that a current information system has or at an opportunity for a new system. In this part of the developmental life cycle, you try to decide whether development makes sense. You need to ask yourself if the design, coding, and implementation of a spreadsheet system will benefit the business.

If you're thorough, you'll produce a cost-benefit analysis. You can use this to quantify your assessment and to involve management in the feasibility evaluation. At this stage, you're simply making a go or no-go decision.

You need to examine feasibility throughout the developmental cycle, specifically at the end of each of the phases. You might find that once you get into development, the actual scope of a project is larger than you anticipated. So even though the project made sense in the initial investigation, continuing with it may not be cost-effective.

STUDY THE CURRENT SYSTEM

In the study phase, you need to find out how the current business system works. You must fully understand the business problem before you can competently program a solution. As you learn about the current system, you're likely to uncover other problems and opportunities for improvement not noticed by the workers or management. On the other hand, you may find that the problems or opportunities you learned about in the survey phase are not significant enough to warrant a new system.

During the study of the current system, you may want to create a data-flow diagram. This traces the flow of information through a system and identifies the processes that act on the information, as well as where data is stored. Figure 1 shows an example of such a diagram. You can

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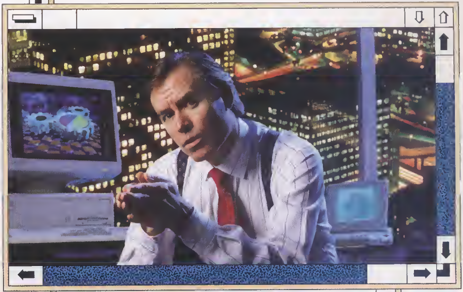

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FOR DEVELOPERS

THE SYSTEMS-DEVELOPMENT LIFE CYCLE

For those really important projects, discover the power of prototypes.

BY NICK DELONAS

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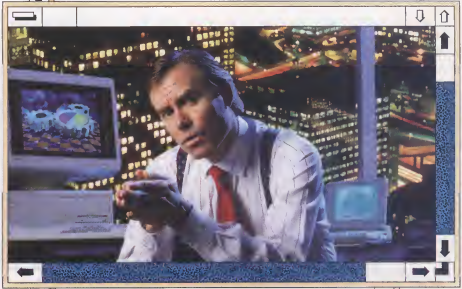

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easily create these diagrams by using plastic templates that you can buy at office-supplies stores.

After you understand the current system, you need to find out what the users and management expect from the new system. What do they think the system will do? What kind of performance level do they want? Then you need to investigate some of the technical requirements. What will the data inputs and outputs be? What kind of information will you need to save in the system? Can you save all that data in a spreadsheet or do you need additional database software? And how powerful a PC will the new system likely need?

Start by finding out what information your users require. Once you know this, it will be easier to determine what inputs your model will need.

EVALUATION

In the evaluation phase, you assess your options. How much of the system should you try to automate? Is the problem really suited to a spreadsheet solution?

If a spreadsheet solution is feasible, you must decide how the new system will work. You can create system flowcharts (figure 2) that show how your spreadsheet program might fit into the work system. Some developers find creating these charts more useful than others do. But whether or not you create a flowchart for each of the possible programming solutions, you need to evaluate each alternative from the perspective of technical, operational, and economic feasibility. For example, is the solution technically practical and do you have the expertise to program such a system?

From the operational perspective, will your model satisfy the users and meet their needs? How will it change the way they work and their work environment? Will it create new problems?

From the economic standpoint, what will it cost to develop and operate the model? How much training will you need to do? Do your users need to buy one or more PCs? Is the solution cost-effective overall?

BUILD A PROTOTYPE

If you decide to go ahead with the project, you enter a phase in which you actually do some programming. You create a prototype model that you'll show the user. This

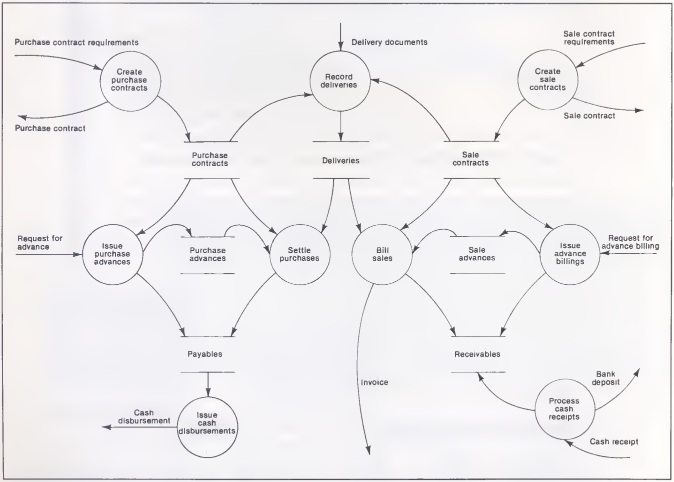


FIGURE 1. This data-flow diagram from Steve Eckols's book *How to Design and Develop Business Systems* (Mike Murach & Associates Inc.) outlines the work flow for a brokerage system. The circles represent processes and the parallel lines represent data storage of one type or another. Diagrams such as these help you understand the full scope of a business process before you try to automate any of it by using a spreadsheet program.

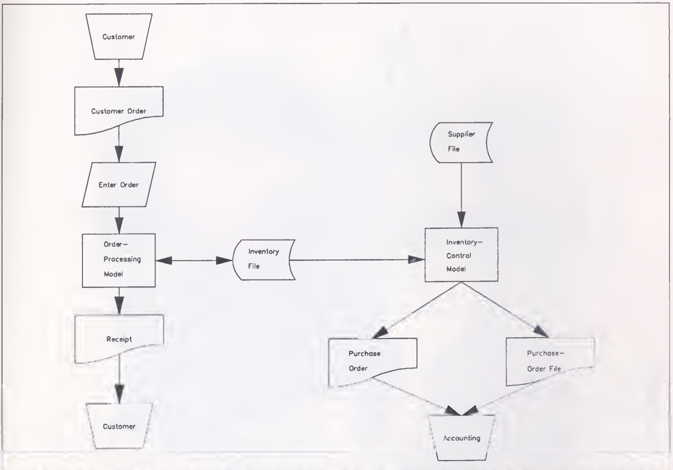


FIGURE 2. Here's an example of a system flowchart that follows the style used in Whitten, Bentley, and Ho's *Systems Analysis and Design Methods*. You can use a system flowchart to clarify how your spreadsheet will fit into the work flow of a business.

prototype will help identify potential problems and help focus the direction of the development. And this process will, in the end, make for happier users.

Your prototype should confirm previous agreements and correct any misunderstandings. Make sure the users review all screens, menus, and reports. The users will then tell you if the model is complete, if it presents the data in the correct order, and if the procedures are practical.

Start by creating the screens and the menu system. Show this early prototype to the intended users before you code further. You can create dummy routines that allow the users to see how the system will eventually work. A dummy routine is a simple macro that serves as a stand-in for a large routine that you haven't yet written. At most it may flash a message or sound a beep. For example, a dummy routine that takes the place of a future printing routine might flash the message *Now the accounts receivable report would print. Press any key to continue.* Such dummy routines are simple to create, and they let you code the framework of the whole system before doing any detailed programming.

GET FEEDBACK, MODIFY THE PROTOTYPE UNTIL COMPLETION

Next you need to modify the prototype until it is a fully functional model that's ready for installation. Create dummy data for testing the routines as you code them. At the completion of each major routine, have the users test the prototype again. When appropriate, get users to approve each revision of the prototype. For example, if they want you to change everything but the title screen, get them to approve at least the title screen.

After your prototype is complete, you may find that it doesn't function efficiently enough. If that's the case, you (or other programmers) may have to rewrite the prototype in a more efficient language, such as Cobol. That's a perfectly legitimate outcome and may even be a goal. There's no reason why you can't use *1-2-3* or *Symphony* to create prototypes to specify the design requirements for another language. While this developmental approach has some redundancy, it gives users a good idea of what they're getting. The prototype demonstrates that the final system will be workable. This helps management make more-intelligent cost-benefit decisions. ■

A *Spreadsheet* Business Planner

Create a balance sheet, a cash flow statement, and an income statement for your business.

BY STEPHEN L. NELSON

If you run a business or plan to start one, a business plan built in *1-2-3* or *Symphony* can help you gauge the potential profitability of your enterprise. A detailed template such as the one presented in this article also helps you to anticipate your company's financial needs and to avoid the pitfalls that come with unmanaged growth. This kind of analysis is important for any entrepreneur, but it is almost essential if you want to attract investors to your new business.

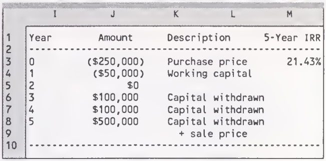
A business plan grows out of a number of underlying assumptions you make about your anticipated revenues, operating costs, and capital requirements. Figure 1 on page 40 shows the input categories that are the basis for several financial statements, which include a balance sheet (figure 2), a cash flow summary (figure 3), and an income statement (figure 4). Together these statements measure a venture's financial viability and potential.

In the next section we'll take a look at how the model was used to analyze the hypothetical manufacturing business depicted in the figures. It's not necessary to build the model to understand this part of the discussion. In a later section we'll examine the model's internal relationships in greater detail and tell you what changes you can make to analyze a business that you're starting from scratch.

A HYPOTHETICAL CASE STUDY

Consider the case of a small manufacturer of specialty clothing, Armadillo Togs, that is up for sale. Carol Armadillo, the owner of the company, has been operating her business successfully for years but now she finds that she must raise cash to pay for her son's graduate-school education. Her asking price for the company is $250,000.

You think you may be interested in this deal, so you construct the following worksheet to give yourself an idea of how profitable the investment will be, given certain assumptions.



```
         I          J           K          L         M

1   Year        Amount      Description        5-Year IRR
2   -------------------------------------------------------
3   0         ($250,000)    Purchase price         21.43%
4   1          ($50,000)    Working capital
5   2                $0
6   3          $100,000     Capital withdrawn
7   4          $100,000     Capital withdrawn
8   5          $500,000     Capital withdrawn
9                             + sale price
10  -------------------------------------------------------
```

The amounts in column J represent the capital you expect to invest in and withdraw from the business. The $250,000 purchase price is a capital outflow and is entered as a negative number in cell J3. You also expect to contribute $50,000 in working capital in the first year to expand the business. This is represented as a capital outflow in cell J4. You plan to make no capital contributions or withdrawals in the second year. In the third, fourth, and fifth years, you plan to withdraw $100,000 in profit, and at the end of the fifth year, you plan to sell the business for $400,000.

In cell M3 you enter the formula @IRR(0.1,J3..J8), where the first parameter represents a guess of a 10% rate of return on the investment. The formula indicates that if the investment in the clothing company works out as

A business plan helps you anticipate your company's financial needs.

planned, your rate of return will be 21.43%. You think this is a worthwhile return, so you proceed.

To analyze the potential of this deal, you will use the template shown in figures 1 through 4. The template is set up to analyze financial performance over five periods. You decide to let each period equal one year. For a smaller business, you might use a shorter period of time to monitor cash flow more accurately. If this were a business that had a unique business cycle—say, one lasting 30 weeks—you would probably want to let one period equal that amount of time.

Because Carol has done a good job of bookkeeping, you have all the information you need for the model's input cells (shaded in the figures). The model begins with Period 0, which we use to represent the company's performance during the last year.

You begin by estimating potential sales revenue. The model assumes that past performance is an indicator of the future. Carol's books show that sales revenue for the last year was $650,000. After checking prior periods to make sure this performance wasn't a fluke, you enter $650,000 in cell B8.

Next you must project sales revenue for the five periods covered by the model. One reason you are attracted to this deal is that you think you can make the company more profitable by aggressively marketing its line of clothing. Your ambitious plan calls for a 20% period-to-period sales increase over the next five periods. You enter *20%* in cell B9, which the model uses to calculate the revenue projections in range C8..G8.

ESTIMATE EXPENSES

For each period, the cost of purchases equals starting inventory plus purchases of goods less ending inventory. Carol's records indicate that her purchases of goods totaled $230,000 over the past year. A just-completed phys-

ILLUSTRATIONS BY G. BRIAN KARAS

ical inventory yielded a total of $23,000 worth of goods. You enter these amounts in cells B14 and B15, respectively. Inventory one year ago, at the beginning of Period 0, was $24,000, which you enter in cell B13. In cell B16 the model adds up the cost of purchases for Period 0. It uses this same formula to add the cost of purchases for the next five periods (range C16..G16).

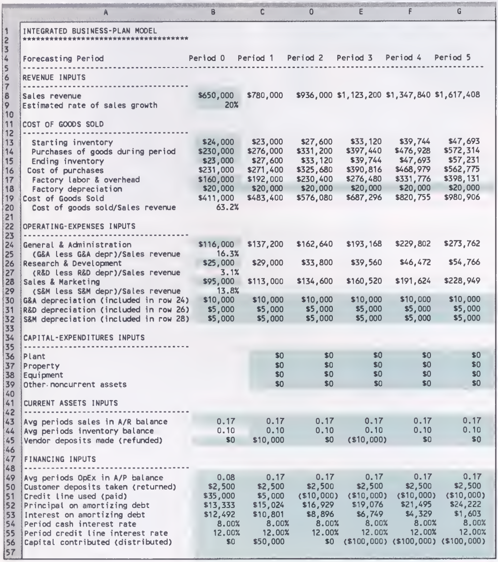
Cost of goods sold also includes the labor, overhead, and depreciation costs associated with the factory. These costs are entered in range B17..B18. Cell B19 sums cells B16..B18 to arrive at an overall figure for cost of goods sold for Period 0. In cell B20 the model calculates the ratio between cost of goods sold and sales revenue for Period 0, a key indicator for many businesses.

This example divides operating expenses into three traditional categories: general and administrative, research and development, and sales and marketing. To adapt the model to reflect a different breakdown of these expenses, change the labels in range A24..A32 and insert or delete rows, or simply insert or delete rows.

General and administrative (G&A) expenses include salaries, payroll taxes, telephone costs, utilities, postage, and building rent, to name some larger items. These expenses are often broken out in detail in a separate schedule.

Carol counts her own salary as part of this category. If her business were set up as a proprietorship rather than a corporation, the $50,000 salary she paid herself for the year would be considered a "cash draw" and would be counted as capital distributed in cell B56. The same would be true for you if you intended to run the business as a proprietorship and to draw a salary.

The next operating-expense category is Research & Development. Carol has one employee whom you include in this category because he develops new fashion lines. His salary and expenses total $25,000, which you enter in cell B26. When you press the CALC key, the model will calculate the Period 0 ratio of R&D expense to sales revenue in cell B27 and use this ratio to estimate R&D expenses for Periods 1 through 5. In a similar manner, the model will use the Period 0 sales-and-marketing expense



	A	B	C	0	E	F	G
1	INTEGRATED BUSINESS-PLAN MODEL						
2	**************************************						
3							
4	Forecasting Period	Period 0	Period 1	Period 2	Period 3	Period 4	Period 5
5	-----------------------------------	----------	----------	----------	----------	----------	----------
6	REVENUE INPUTS						
7	-----------------------------------						
8	Sales revenue	$650,000	$780,000	$936,000	$1,123,200	$1,347,840	$1,617,408
9	Estimated rate of sales growth	20%					
10							
11	COST OF GOODS SOLD						
12	-----------------------------------						
13	Starting inventory	$24,000	$23,000	$27,600	$33,120	$39,744	$47,693
14	Purchases of goods during period	$230,000	$276,000	$331,200	$397,440	$476,928	$572,314
15	Ending inventory	$23,000	$27,600	$33,120	$39,744	$47,693	$57,231
16	Cost of purchases	$231,000	$271,400	$325,680	$390,816	$468,979	$562,775
17	Factory labor & overhead	$160,000	$192,000	$230,400	$276,480	$331,776	$398,131
18	Factory depreciation	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
19	Cost of Goods Sold	$411,000	$483,400	$576,080	$687,296	$820,755	$980,906
20	Cost of goods sold/Sales revenue	63.2%					
21							
22	OPERATING-EXPENSES INPUTS						
23	-----------------------------------						
24	General & Administration	$116,000	$137,200	$162,640	$193,168	$229,802	$273,762
25	(G&A less G&A depr)/Sales revenue	16.3%					
26	Research & Development	$25,000	$29,000	$33,800	$39,560	$46,472	$54,766
27	(R&D less R&D depr)/Sales revenue	3.1%					
28	Sales & Marketing	$95,000	$113,000	$134,600	$160,520	$191,624	$228,949
29	(S&M less S&M depr)/Sales revenue	13.8%					
30	G&A depreciation (included in row 24)	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000
31	R&D depreciation (included in row 26)	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
32	S&M depreciation (included in row 28)	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
33							
34	CAPITAL-EXPENDITURES INPUTS						
35	-----------------------------------						
36	Plant		$0	$0	$0	$0	$0
37	Property		$0	$0	$0	$0	$0
38	Equipment		$0	$0	$0	$0	$0
39	Other noncurrent assets		$0	$0	$0	$0	$0
40							
41	CURRENT ASSETS INPUTS						
42	-----------------------------------						
43	Avg periods sales in A/R balance	0.17	0.17	0.17	0.17	0.17	0.17
44	Avg periods inventory balance	0.10	0.10	0.10	0.10	0.10	0.10
45	Vendor deposits made (refunded)	$0	$10,000	$0	($10,000)	$0	$0
46							
47	FINANCING INPUTS						
48	-----------------------------------						
49	Avg periods OpEx in A/P balance	0.08	0.17	0.17	0.17	0.17	0.17
50	Customer deposits taken (returned)	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500
51	Credit line used (paid)	$35,000	$5,000	($10,000)	($10,000)	($10,000)	($10,000)
52	Principal on amortizing debt	$13,333	$15,024	$16,929	$19,076	$21,495	$24,222
53	Interest on amortizing debt	$12,492	$10,801	$8,896	$6,749	$4,329	$1,603
54	Period cash interest rate	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
55	Period credit line interest rate	12.00%	12.00%	12.00%	12.00%	12.00%	12.00%
56	Capital contributed (distributed)	$0	$50,000	$0	($100,000)	($100,000)	($100,000)
57							

FIGURE 1. The model uses the data in this figure to generate the financial statements in figures 2, 3, and 4. Shaded areas in the figure represent inputs you must make. The model uses Period 0 inputs as a basis for revenue and cost projections in Periods 1 through 5. You can write over the formulas in this figure with your own formulas or values where appropriate.

you enter in cell B28 in order to project your sales-and-marketing expenses for Periods 1 through 5.

It is standard accounting practice to include depreciation as part of operating expense, as well. The $116,000 G&A expense for Period 0 (cell B24) includes $106,000 in cash expenditures plus the $10,000 worth of depreciation you see in cell B30. The $10,000 worth of depreciation is an accounting convention that represents the decline in value of the business's G&A equipment as it grows older. For accounting and tax purposes, you are allowed to take depreciation on an item even if its value is steady or rising.

Begin by estimating potential sales revenue.

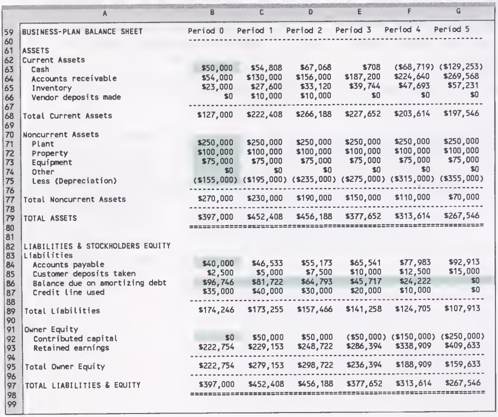
You can see in rows 30 through 32 that each category of operating expenses is assigned its own depreciation. However, if you purchased a new computer that was to be used partly for administrative work and partly for designing marketing brochures, it would be appropriate to split the computer's depreciation between the G&A and S&M depreciation categories.

The plant and each item of equipment have individual depreciation schedules. You would use a separate worksheet to calculate depreciation amounts for each item in each period. Then you would add them together in their proper categories and use the totals in this model. Be aware that the depreciation figures used in this example are made-up numbers and do not represent this kind of careful analysis.

ASSET AND FINANCING INPUTS

You enter your planned investments in plant, property, equipment, and other noncurrent assets in the Capital Expenditures Inputs section of the model. Since your initial analysis of the company will assume no new capital investments during the five years, you enter zeros in all the cells of this section.

In the Current Assets Inputs section of the model, you estimate how your current assets will perform. The major current asset that this section doesn't track is cash, which is treated in greater detail in the cash flow schedule of figure 3. The accounts receivable figures shown in row 43 of figure 1 are ratios that are used to calculate whole-



	A	B	C	D	E	F	G
59	BUSINESS-PLAN BALANCE SHEET	Period 0	Period 1	Period 2	Period 3	Period 4	Period 5
60							
61	ASSETS						
62	Current Assets						
63	Cash	$50,000	$54,808	$67,068	$708	($68,719)	($129,253)
64	Accounts receivable	$54,000	$130,000	$156,000	$187,200	$224,640	$269,568
65	Inventory	$23,000	$27,600	$33,120	$39,744	$47,693	$57,231
66	Vendor deposits made	$0	$10,000	$10,000	$0	$0	$0
67							
68	Total Current Assets	$127,000	$222,408	$266,188	$227,652	$203,614	$197,546
69							
70	Noncurrent Assets						
71	Plant	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000
72	Property	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
73	Equipment	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000
74	Other	$0	$0	$0	$0	$0	$0
75	Less (Depreciation)	($155,000)	($195,000)	($235,000)	($275,000)	($315,000)	($355,000)
76							
77	Total Noncurrent Assets	$270,000	$230,000	$190,000	$150,000	$110,000	$70,000
78							
79	TOTAL ASSETS	$397,000	$452,408	$456,188	$377,652	$313,614	$267,546
80							
81							
82	LIABILITIES & STOCKHOLDERS EQUITY						
83	Liabilities						
84	Accounts payable	$40,000	$46,533	$55,173	$65,541	$77,983	$92,913
85	Customer deposits taken	$2,500	$5,000	$7,500	$10,000	$12,500	$15,000
86	Balance due on amortizing debt	$96,746	$81,722	$64,793	$45,717	$24,222	$0
87	Credit line used	$35,000	$40,000	$30,000	$20,000	$10,000	$0
88							
89	Total Liabilities	$174,246	$173,255	$157,466	$141,258	$124,705	$107,913
90							
91	Owner Equity						
92	Contributed capital	$0	$50,000	$50,000	($50,000)	($150,000)	($250,000)
93	Retained earnings	$222,754	$229,153	$248,722	$286,394	$338,909	$409,633
94							
95	Total Owner Equity	$222,754	$279,153	$298,722	$236,394	$188,909	$159,633
96							
97	TOTAL LIABILITIES & EQUITY	$397,000	$452,408	$456,188	$377,652	$313,614	$267,546
98							
99							

FIGURE 2. This balance sheet identifies basic categories of assets and liabilities. Owner equity, the difference between assets and liabilities, is in row 95. Totals for the two sections of the balance sheet, Assets (row 79) and Liabilities & Equity (row 97), should always equal each other.

number amounts. They represent the average amount of time it takes a customer to pay divided by the time in the period. Carol tells you that the average time to pay is two months. Since there are twelve months in the period, you enter *2/12* in cell B43. You have no reason to believe that you'll be able to improve on this record, so you copy cell B43 to range C43..G43.

In cell B44, the ending inventory you entered in cell B15 is divided by the total amount spent on goods in cell B14 to arrive at a ratio of .10. This means that Carol's inventory of goods purchased turns over, on average, in about one-tenth of a year. This ratio is enviable in many businesses, so you use the Range Value(s) command to copy it to range C44..G44.

The vendor deposits in row 45 include the amounts you prepay to vendors as part of placing an order or as security for doing business. You know that to get credit with a certain wholesaler, you will have to pay a two-year security deposit of $10,000 in Period 1, so you enter *10000* in cell C45. Since you'll get the money back in Period 3, you enter *–10000* in cell E45.

Rows 49 through 56 cover the business's financing inputs. The accounts payable ratios in row 49 are the inverse of the accounts receivable ratios in row 43. You find that Carol pays her bills quickly—in an average of a month's time. Since a month is one-twelfth of a year, you enter *1/12* in cell B49. You intend to stretch out your payments to an average of two months' time to delay cash outflows. To represent this, you enter *2/12* in cell C49 and copy it to range D49..G49.

The customer deposits in row 50 are the flip side of vendor deposits. In this case they include deposits you receive from customers for orders. Carol tells you that you can count on keeping the nonrefundable $2,500 deposit of at least one failed retailer per year, so you enter *2500* in cell B50 and copy it to C50..G50.

Carol has two kinds of debt outstanding: a revolving credit line and an amortizing loan. There's currently $35,000 outstanding on the credit line, so you enter *35000* in cell B51. You intend to draw another $5,000 to pay for expenses in Period 1, then pay back the $40,000 outstanding in $10,000 increments over the next four periods. You enter *5000* in cell C51 and *–10000* in range D51..G51.

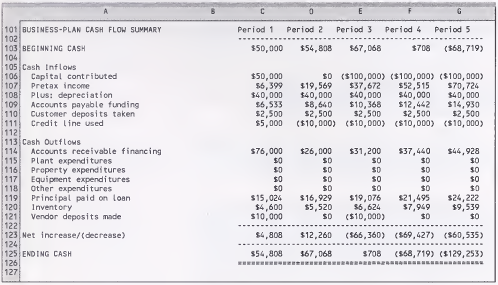
The other debt is a 10-year, 12% loan of $150,000. Carol has paid exactly half of the 120 monthly installments. On a separate worksheet, you figure out how much interest and principal will be repaid in each of the next five years and enter these amounts in rows 52 and 53. If you aren't sure how to do this, see "What You Owe: The Loan-Status Analyzer" in the November issue, page 56.

In row 54, you enter your period cash interest rate. This is the amount you earn on your cash balances. The company's money market account has been earning 8% annual interest during Period 0, so you enter *.08* in cell B54. For lack of a better guess, you assume this interest rate will remain at 8% throughout the five periods, so you copy cell B54 to range C54..G54.

In a similar fashion, you also need to enter in row 55 the period credit line interest rate, which calculates the interest on your credit line. The company's credit line carries an annual interest rate of 12%, so you enter *.12* in cell B55 and copy that cell to range C55..G55.

CAPITAL: HOW MUCH IS ENOUGH?

The last inputs in figure 1 concern the flow of capital in and out of the business. Since the model is using this cell to calculate an asset base at the end of Period 0, you enter 0 in cell B56. Now, the hard part. After you've bought the business, how much additional capital will you need to keep it solvent? This is a crucial question because entrepreneurs—especially those starting new businesses—sometimes find it hard to estimate this amount. This can lead to cash flow crises early in the life of the business



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                    A                            B          C          D          E          F          G

101 BUSINESS-PLAN CASH FLOW SUMMARY                      Period 1   Period 2   Period 3   Period 4   Period 5
102                                                     -------------------------------------------------------
103 BEGINNING CASH                                        $50,000    $54,808    $67,068       $708   ($68,719)
104
105 Cash Inflows
106   Capital contributed                                 $50,000         $0  ($100,000) ($100,000) ($100,000)
107   Pretax income                                        $6,399    $19,569    $37,672    $52,515    $70,724
108   Plus: depreciation                                  $40,000    $40,000    $40,000    $40,000    $40,000
109   Accounts payable funding                             $6,533     $8,640    $10,368    $12,442    $14,930
110   Customer deposits taken                              $2,500     $2,500     $2,500     $2,500     $2,500
111   Credit line used                                     $5,000   ($10,000)  ($10,000)  ($10,000)  ($10,000)
112
113 Cash Outflows
114   Accounts receivable financing                       $76,000    $26,000    $31,200    $37,440    $44,928
115   Plant expenditures                                       $0         $0         $0         $0         $0
116   Property expenditures                                    $0         $0         $0         $0         $0
117   Equipment expenditures                                   $0         $0         $0         $0         $0
118   Other expenditures                                       $0         $0         $0         $0         $0
119   Principal paid on loan                              $15,024    $16,929    $19,076    $21,495    $24,222
120   Inventory                                            $4,600     $5,520     $6,624     $7,949     $9,539
121   Vendor deposits made                                $10,000         $0   ($10,000)        $0         $0
122                                                     -------------------------------------------------------
123 Net increase/(decrease)                                $4,808    $12,260   ($66,360)  ($69,427)  ($60,535)
124                                                     -------------------------------------------------------
125 ENDING CASH                                           $54,808    $67,068       $708   ($68,719) ($129,253)
126                                                     =======================================================
127
```

FIGURE 3. The cash flow summary keeps a detailed record of cash inflows and outflows. This example serves as a warning that the owner will not be able to withdraw $100,000 of the company's capital in Periods 3, 4, and 5 (range E106..G106) without running the company into the red in Periods 4 and 5 (range F125..G125).

and to business failures that could have been prevented.

You decide that you're willing to sink $50,000 worth of working capital into the business in Period 1. Therefore, you enter *50000* in cell C56. You will make no capital contributions or withdrawals in Period 2, so you enter 0 in cell D56. In Periods 3 through 5 you intend to withdraw capital amounting to $100,000 per period, in accordance with the investment plan shown in the figure on page 38. You enter *–100000* in range E56..G56.

Cost of goods sold includes factory overhead.

We'll soon be able to use the model to see if these expectations are reasonable. First, though, we must move to the input cells of the balance sheet, which are in the shaded areas of figure 2.

The current assets owned by the business are fairly easy to determine. There is $50,000 in the company's money market account, and you can verify $54,000 worth of accounts receivable. You enter these amounts in cells B63 and B64, respectively.

Noncurrent assets, sometimes called fixed assets, include Carol's manufacturing assembly line, which originally cost $250,000. Her warehouse and the land it is situated on are now worth $100,000. Other noncurrent assets include her fixtures and small equipment, which cost her a total of $75,000. These inputs go in range B71..B73. The building and the individual items of equipment have been depreciating, each on its own schedule, during the time she has owned them. You use a separate worksheet to total the cumulative depreciation of all these items and find it comes to $155,000. You enter *−155000* in cell B75.

The company's liabilities and owner equity are grouped in the next section of the balance sheet. Carol verifies that there are currently $40,000 worth of accounts payable, so you enter that amount in cell B84. In row 86 you enter the balance due on the fixed-rate loan at the end of each year. These amounts will come from the same worksheet you constructed to figure out the principal and interest on this debt, which you entered in rows 52 and 53.

Finally, you enter 0 in cell B92 and press the CALC key. Does this investment meet your goals?

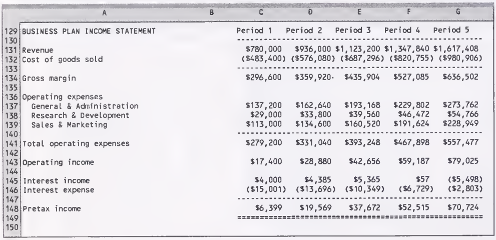
The bottom line of the income statement looks promising. You see in row 148 that under the assumptions you have made in figure 1, the business will post a growing profit.

Now look at the bottom line of figure 3, which shows ending cash. Cash flow won't be a problem in the first two years, thanks to the $50,000 in capital you contributed in Period 1, which shows up in cell C106. However, your plan to withdraw $100,000 in profits in Periods 3, 4, and 5 will run the company's cash balance into the red during Period 4.

It's time to tinker with the model. We'll see how changes in assumptions and expectations can affect the bottom lines of the balance sheet, the cash flow statement, and the income statement. If you wish to follow the discussion in the next section, build the model now, using the instructions in the box on pages 44 and 45.

WORK WITH THE MODEL

After researching the clothing industry, you believe that you can increase your workers' productivity by investing $50,000 in state-of-the-art sewing equipment. Workers who use such equipment produce more goods in less time, which holds down the cost of wages. Using this



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              A                           B        C          D          E          F          G

129 BUSINESS PLAN INCOME STATEMENT               Period 1   Period 2   Period 3   Period 4   Period 5
130                                             -----------------------------------------------------
131 Revenue                                      $780,000   $936,000 $1,123,200 $1,347,840 $1,617,408
132 Cost of goods sold                         ($483,400) ($576,080) ($687,296) ($820,755) ($980,906)
133                                             -----------------------------------------------------
134 Gross margin                                 $296,600   $359,920·  $435,904   $527,085   $636,502
135
136 Operating expenses
137   General & Administration                   $137,200   $162,640   $193,168   $229,802   $273,762
138   Research & Development                      $29,000    $33,800    $39,560    $46,472    $54,766
139   Sales & Marketing                          $113,000   $134,600   $160,520   $191,624   $228,949
140                                             -----------------------------------------------------
141 Total operating expenses                     $279,200   $331,040   $393,248   $467,898   $557,477
142
143 Operating income                              $17,400    $28,880    $42,656    $59,187    $79,025
144
145 Interest income                                $4,000     $4,385     $5,365        $57   ($5,498)
146 Interest expense                            ($15,001)  ($13,696)  ($10,349)   ($6,729)   ($2,803)
147                                             -----------------------------------------------------
148 Pretax income                                  $6,399    $19,569    $37,672    $52,515    $70,724
149                                             =====================================================
150
```

FIGURE 4. The income statement, also called a profit-and-loss statement, subtracts all costs associated with running the business from revenue in order to get operating income (row 143). The model then adds the interest income and expense associated with the company's cash balances and outstanding line of credit to arrive at pretax income (row 148).

strategy, on a separate worksheet you calculate that you can reduce your factory labor and overhead to 20% of revenues.

To simulate this scenario, enter *50000* in cell C38. Overwrite the formula in cell C17 with the formula .2*C8 and copy it to range D17..G17. Assume that you figured out the depreciation for this equipment on your depreciation schedule and that it raised the factory depreciation total to $25,000 for each of the five years. Enter *25000* in cell C18 and copy it to range D18..G18. Then press CALC.

Now examine the ending cash balances for Periods 1 through 5 in row 125. At the end of Period 5, the company will have a cash balance of more than $108,000 if the new scenario is valid. In addition, the balance sheet will be greatly improved. Your owner equity at the end of the fifth year (cell G95) will stand at $422,306, a marked improvement over the original scenario.

The importance of revenue and cost projections becomes evident if you test a scenario that isn't so optimistic. Assume the sales-growth rate is 10% rather than 20%. Enter *.1* in cell B9 and press CALC. The business would still be making a profit on operations (row 148). But ending cash for Period 5 (cell G125) is dangerously low due to the heavy capital withdrawals in Periods 3, 4, and 5. Thus, 10% growth, which many companies would consider healthy, might prove disastrous in the context of your plan.

It is also important to consider capital-expenditures inputs. Enter *.2* in cell B9 and press CALC to return to the previous scenario for sales growth. To sustain this 20% annual growth rate over the five-year period, it's likely that you'll need more than a single capital outlay for new equipment. You would likely need to expand your plant and perhaps have to extend the size of your property to do it. The balance sheet shows that although total assets during the five-year period (row 79) are registering an increase, most of the increase is in the form of current assets. Your noncurrent assets (row 77) show a precipitous decline.

Experiment with your revenue, cost, capital, and other inputs to see how they affect the bottom lines of the three financial statements. Be aware that you don't have to follow the constant growth patterns set forth in this example. There's nothing wrong with writing over the formulas in rows 8, 14, 17, 24, 26, and 28 with values in this manner. The formulas in these ranges are designed to be guides—mainly to keep you from entering impossible values just to make the bottom-line numbers "work." But if you have a logical reason for substituting a value, by all means do so. For example, you shouldn't let the model

HOW TO SET UP THE BUSINESS-PLAN WORKSHEET

1. Releases

The model works in *1-2-3* Releases 2.01, 2.2, and 3 and in *Symphony* 2.0.

2. Default settings

Recalculation: Manual

1-2-3: /Worksheet Global Recalculation (in Release 3, Recalc) Manual
Symph: MENU Settings Recalculation Method Manual Quit

Column-Width: 11

1-2-3: /Worksheet Global Column-Width (in Release 3, Col-Width), enter *11*
Symph: MENU Settings Width, enter *11,* select Quit

Format: Currency 0

1-2-3: /Worksheet Global Format Currency, enter *0*
Symph: MENU Settings Format Currency, enter 0, select Quit

3. Individual column width

Column	Width
A	37

With the cell pointer in column A, select /Worksheet Column Set-Width (*Symph:* MENU Width Set) and enter *37.*

4. Cell formats

Format	Range
Percent 0	B9
Percent 1	B20, B25, B27, B29
Percent 2	B54..G55
Fixed 2	B43..G44, B49..G49

For example, to set the format of cell B9, select /Range Format Percent, enter *0,* indicate cell B9, and press Return.

In *Symphony,* select MENU Format %, enter *0,* indicate cell B9, and press Return.

5. Page breaks

Should you decide to print the worksheet, page breaks will cause the four sections of the model presented in figures 1 through 4 to be printed on separate pages. Enter the page-break symbols found in cells A57, A99, A127, and A150. For example, to create the page-break symbol in cell A57 in *1-2-3*, place the cell pointer in cell A57 and select /Worksheet Page.

To create the symbol in *Symphony,* place the cell pointer in cell A57 and type a split vertical bar followed by two colons (¦::). This method also works in *1-2-3*.

6. Labels

Enter all labels shown in figures 1 through 4. Indented labels begin with one or two spaces. Create the lines of single dashes by entering \- in cell A5 and copying it to cells and ranges that contain single dashed lines. Follow the same procedure for the double dashed lines by entering \= in cell B80 and copying it to the appropriate ranges. Enter * in cell A2.

7. Values

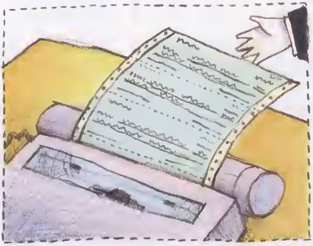
Enter the values shown in the shaded areas of figures 1 and 2. Enter *2/12* in cell B43 and copy cell B43 to range C43..G43. Enter *1/12* in cell B49. Enter *2/12* in cell C49 and copy cell C49 to range D49..G49.

8. Enter and copy formulas

Cell	Formula
C8	+B8*(1+$B9)
C13	+B15
C14	($B14/$B8)*C8
C15	+C14*C44
B16	+B13+B14−B15
C16	+C13+C14−C15
C17	($B17/$B8)*C8
B19	@SUM(B16..B18)
C19	@SUM(C16..C18)

Copy range C8..C19 to range D8..G8.

estimate a 20% growth rate for all five periods if you really expect a lower rate in earlier periods.



Operating expenses span a broad spectrum.

DEPRECIATION: A STICKY QUESTION

The foregoing discussion was intended to give you a feel for the model—how to make inputs and what to look for in the results. The relationships within the model are tricky, but the formulas themselves aren't complex. With a little time and effort, you'll be able to trace the flow of the template and see how changing certain inputs affects the various accounting statements. A good accounting textbook will help explain the relationships between the different categories if you're still perplexed.

One category that can confuse almost anyone, though, is depreciation. We've mentioned it above, but since it's such a sticky question, we'll discuss its relationship to the different parts of the model. Enter *0* in cell C38 and *20000* in range C18..G18. Then enter the formula ($B17/$B8)*C8 in cell C17, copy it to range D17..G17, and press CALC to make your spreadsheet match the figures again for the following discussion.

The depreciation amounts you enter in figure 1 affect each of the accounting statements in figures 2 through 4. Look first at row 75 of the balance sheet in figure 2. Row 75 tracks cumulative depreciation. Previously accumulated depreciation is added to the depreciation of each new period. This is why you must identify depreciation as a subcategory of expenses for cost of goods sold and operating expenses for each period in rows 18, 30, 31, and 32.

If you look at the income statement in figure 4, you see that the expenses for cost of goods sold (row 132) and

B20	+B19/B8
C24	+C$8*$B25+C30
C26	+C$8*$B27+C31
C28	+C$8*$B29+C32

Copy range C24..C28 to range D24..G24.

B25	(B24−B30)/B$8
B27	(B26−B31)/B$8
B29	(B28−B32)/B$8
B44	+B15/B14
C63	+C125
C64	+C8*C43
B65	+B15
B66	+B45
C65	+C15
C66	+B66+C45
B68	@SUM(B61..B67)
C68	@SUM(C61..C67)
C71	+B71+C36
C72	+B72+C37
C73	+B73+C38
C74	+B74+C39
C75	+B75−@SUM(C18,C30..C32)
B77	@SUM(B70..B76)
C77	@SUM(C70..C76)
B79	+B68+B77
C79	+C68+C77
C84	+C49*C141
B85	+B50
C85	+B85+C50

Copy range C63..C85 to range D63..G63.

B87	+B51
C87	+B87+C51
B89	@SUM(B83..B88)
C89	@SUM(C83..C88)
C92	+B92+C56
B93	+B79−B89
C93	+B93+C148
B95	+B92+B93
C95	+C92+C93
B97	+B89+B95
C97	+C89+C95

Copy range C87..C97 to range D87..G87.

C103	+B63
D103	+C125

Copy cell D103 to range E103..G103.

C106	+C92−B92
C107	+C148
C108	@SUM(C18,C30..C32)
C109	+C84−B84
C110	+C85−B85
C111	+C87−B87
C114	+C64−B64
C115	+C71−B71

Copy cell C115 to range C116..C118.

C119	+C52
C120	+C65−B65
C121	+C66−B66
C123	@SUM(C106..C111)−@SUM (C114..C121)
C125	+C103+C123

Copy range C106..C125 to range D106..G106.

C131	+C8
C132	−C19
C134	+C131+C132
C137	+C24
C138	+C26
C139	+C28
C141	@SUM(C136..C140)
C143	+C134−C141
C145	+C54*B63
C146	−C55*B87−C53
C148	+C143+C145+C146

Copy range C131..C148 to range D131..G131.

Now press CALC. The entries in your spreadsheet should match those in figures 1 through 4. A quick way to check is to look at ranges B79..G79 and B97..G97. Make sure they match each other and match the numbers in the figure. If they do not, go back and check your input entries and cell formulas.

9. Save the file

To save the template with its formulas intact, select /File Save (*Symph:* SERVICES File Save), type a file name that isn't already listed in your default directory, and press Return.

operating expenses (rows 137 through 139) come directly from the corresponding figures (range C19..G28) in figure 1. These amounts *include* depreciation, since depreciation is a cost of doing business. The bottom-line result for Period 1, pretax income, is a $6,399 profit (cell C148).

Depreciation is an accounting convention.

The $6,399 profit is used in calculating your ending cash balance for Period 1 in cell C107 of figure 3. To arrive at this profit amount, the income statement subtracted $483,400 for cost of goods sold and $279,200 for operating expenses. However, $40,000 in depreciation was included in these amounts, from rows 18, 30, 31, and 32. Actual cash outlays were only $463,400 and $259,200, respectively. So you must add *back* the $40,000 depreciation amount to get an accurate cash balance. The model does this in cell C108.

STARTUPS AND OTHER CHANGES

If you're starting a new business, this model makes it easier to get up and running. Simply enter 0 in all the input cells for Period 0 (the shaded cells in column B) in figures 1 and 2. But you must be careful. The Period 0 inputs from an existing business provide a helpful track record that allows you to make reasonable assumptions about future periods. A business plan for a new venture, therefore, requires careful research.

Three sources available at most public libraries provide a number of key business ratios for an array of industries: Dun & Bradstreet's *Industry Norms and Key Business Ratios*, Robert Morse Associates' *Annual Statement Studies*, and the *Quarterly Financial Report*, published by the U.S. Department of Commerce Bureau of Census.

The model uses Period 0 inputs to project sales revenue and operating expenses, so you'll have to make some adjustments if you enter 0 for all of your Period 0 inputs. You can enter revenue and expense estimates for all five periods. Or you can enter estimates only for Period 1 (in range C8..C28), leave the formulas for the remaining four periods intact, and let the model do the forecasting. If you choose the latter approach, you'll have to change the formulas for the following cells:

Cell	**Formula**
B20	+C19/C8
B25	(C24−C30)/C$8
B27	(C26−C31)/C$8
B29	(C28−C32)/C$8
D14	($C14/$C8)*D8
D17	($C17/$C8)*D8

Copy the last two formulas to ranges E14..G14 and E17..G17, respectively.

The adjusted formulas use Period 1 inputs rather than Period 0 inputs as a baseline for projecting performance in Periods 2 through 5. You'll also need to erase the formula in cell B44 to prevent it from displaying ERR in the worksheet.

If you want to use this model for a service business, set your cost of goods sold to zero by entering 0 in range B13..B15. This range tracks the tangible materials used in producing a company's product, so it's irrelevant if the only input is your time. You would also enter zeros in range B17..G18. Your overhead expenses will still be covered in the Operating Expenses part of the model. If you're in a nonmanufacturing business, such as retailing, you'll continue to use the inventory inputs in range B13..B15, but you can enter zeros for the factory inputs in range B17..G18.

If your business has noncash operating expenses similar to depreciation, enter these amounts in the depreciation categories in rows 30 through 32. Such expenses might include the depletion expense associated with natural resources or the amortization expense associated with intangible assets, such as copyrights and patents.

To extend the model so that it covers more forecasting periods, copy the last column of the model into as many additional columns as you need. For example, if you want to add five more periods to the model, copy range G1..G148 to range H1..L1. Forecasting periods don't have to equal a year; you can use any period you want as long as the periods are of equal length. In fact, many startup businesses will construct their cash flow statements on a month-to-month basis to avoid unpleasant surprises.

If your business already has a business plan, it's unlikely that the accounting statements presented in this article mirror the ones that your accountant or accounting department prepared. For example, an existing income statement might have different operating-expense categories than the three in this model, and an existing balance sheet may group assets differently. Existing statements, particularly income statements, are likely to be supported by detailed schedules, such as the one we mentioned above for depreciation. But these usually aren't too hard to understand. Once you're comfortable with the accounting relationships embodied in this worksheet, you'll be able to adapt it easily to your situation. ■

Stephen L. Nelson, CPA, is a consultant in Seattle and the author of The Lotus 1-2-3 Money Manager, *published by Microsoft Press.*

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Documentation	(75)	Excellent	Excellent	Excellent	Satisfactory	Excellent	Very Good
Ease of learning	(50)	Excellent	Very Good	Very Good	Satisfactory	Very Good	Very Good
Ease of use	(100)	Very Good	Very Good	Excellent	Good	Excellent	Good
Error handling	(50)	Very Good	Poor	Very Good	Poor	Very Good	Very Good
Support							
Support policies	(25)	Very Good	Very Good	Very Good	Excellent	Very Good	Satisfactory
Technical support	(25)	Good	Satisfactory	Satisfactory	Very Good	Very Good	Satisfactory
Value	(100)	Excellent	Very Good	Excellent	Good	Excellent	Very Good
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CIRCLE 110 ON READER SERVICE CARD

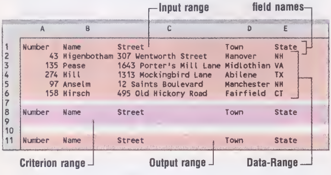
8 Database Enhancements

Time to spruce up an existing database? These tips show you how.

BY SCOTT TUCKER

No matter how much time you spend designing a database, you'll eventually want to enhance it or make it easier to work with. For example, maybe you created a database in which you entered some numbers as values, and you now want to convert them to labels. Or maybe you need a way to print out only selected fields.

Those are just two problems you'll learn to solve in this article on enhancements for *1-2-3* Releases 2.01, 2.2, and 3. To follow the discussion, build and save the database shown below. Like all *1-2-3* databases, this one consists of a row of field names, shown in row 1, followed by some data records, shown in rows 2 through 6. Also included are a Criterion range (in *1-2-3* Releases 2.2 and 3, Criteria range) and an Output range.



```
         A          B                C                  D       E
 1  Number    Name         Street                   Town        State
 2        43 Higenbotham 307 Wentworth Street      Hanover     NH
 3       135 Pease       1643 Porter's Mill Lane   Midlothian  VA
 4       274 Hill        1313 Mockingbird Lane     Abilene     TX
 5        97 Anselm      12 Saints Boulevard       Manchester  NH
 6       158 Hirsch      495 Old Hickory Road      Fairfield   CT
 7
 8  Number    Name         Street                   Town        State
 9
10
11  Number    Name         Street                   Town        State
```

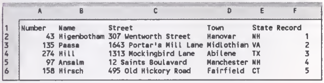
To begin, press slash and select Worksheet Column Set-Width to set the following individual column widths: B—12, C—24, D—11, and E—6. Then enter the data shown in range A1..E6. Precede each entry in range C2..C6 with an apostrophe. Copy range A1..E1 to cells A8 and A11. Save the file under the name SAMPLE. As you read through each tip, retrieve this file and follow along. Don't save the changes you make to this file. If you wish, you can save the file under a different name instead. The point is that the file named SAMPLE should always contain only the data shown above.

1 Use the Data Fill command to number records.

1-2-3 sorts numbers and labels in either ascending or descending order. For most of the work you do in your database, you'll find that these options are sufficient. But you may anticipate that at some point you'll want to restore the data records to the order in which you originally entered them. To do this, you'll need to plan ahead by including in your database a field that stores a record number.

If the file SAMPLE is not still in memory, retrieve it. Before you sort the database for the first time, assign a number to each record. First, enter a unique field name—for example, *Record*—in cell F1. Then use the Data Fill command to assign sequential numbers to the data records.

For example, select /Data Fill, specify a Fill range of F2..F6, a start value of 1, and press Return twice to accept the default step and stop values. *1-2-3* automatically numbers the records, as shown below:



```
        A          B                C                 D         E      F
1  Number   Name        Street                   Town        State Record
2        43 Higenbotham 307 Wentworth Street      Hanovar     NH          1
3       135 Paasa       1643 Portar'a Mill Lane  Midlothian  VA          2
4       274 Hill        1313 Mockingbird Lane     Abilene     TX          3
5        97 Ansalm      12 Saints Boulavard       Manchester  NH          4
6       158 Hirsch      495 Old Hickory Road      Fairfield   CT          5
```

Now no matter how many times you sort the database, you can always restore it to its original order simply by specifying the *Record* field as the primary sort key and by specifying A for ascending sort order.

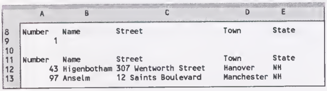
2 Assign range names to the first data record.

Most of the time, a formula in the Criterion range refers to fields in the first record of the database. When you're writing a criterion formula, it's often difficult to remember the cell address of a particular field. And if the database model is large, building the formula by pointing

to the cell takes too long. To write criterion formulas faster in *1-2-3* Releases 2.01 and 2.2, assign each field name as a range name for the corresponding entry in the first record of the database.

Retrieve the file SAMPLE. To assign the range names, select /Range Name Labels Down and specify range A1..E1. Now cell A2 is assigned the name *number*, cell B2 is assigned *name*, and so on, across the row.

Now when you write a criterion formula, use range names rather than cell addresses. For example, to locate all records that have a value of less than 100 in the *Number* field, enter the formula +*number*<100 in cell A9 of the Criterion range. Then select /Data Query Input. Specify range A1..E6 as the Input range. Select Criterion and specify range A8..E9. Select Output and specify range A11..E11. Finally, select Extract Quit. Two records appear in the Output range, as shown below:



```
         A        B             C                  D         E
 8  Number   Name        Street                Town        State
 9         1
10
11  Number   Name        Street                Town        State
12        43 Higenbotham 307 Wentworth Street  Hanover     NH
13        97 Anselm      12 Saints Boulevard   Manchester  NH
```

JAMES ENDICOTT

However, consider three caveats. First, a range name is limited to a maximum of 15 characters. When you use the Range Name Labels Down command, *1-2-3* assigns the first 15 characters as the range name. Since each range name must be unique, no two field names can begin with the same 15 characters. Second, if the model uses a macro, don't choose field names that are the same names as advanced macro commands. Otherwise, the macro will try to run the range name as a subroutine. Third, in Release 3 use field names in formulas without first assigning them as range names. In fact, if you assign range names to the field names, some problems may result.

3 Enter numbers as labels.

Most databases contain numbers that you'll never use in a calculation. These include zip codes, telephone numbers, or inventory part numbers. For some numbers, it's clear that you should precede them with a label prefix. You'll detect a problem immediately if, for example, after you enter the telephone number 555-1379, the number -824 appears in the cell.

With some reference numbers, the need to supply a label prefix isn't obvious. Consider zip codes, for example. It's easy to enter many zip codes without a label prefix into the database and not see a problem. But when you enter the codes for Connecticut, New Hampshire, or New Jersey—states whose codes begin with a zero—*1-2-3* doesn't display the leading zero.

To solve this problem, you simply enter the number as a label. This is a good tip to know before you enter a few hundred records.

Let's say you have hundreds of records and weren't wise to this tip. Fortunately, you can write a string formula that converts a column of zip code numbers to labels and adjusts for missing zeros at the same time.

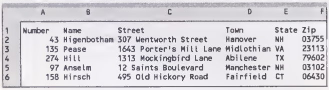
Retrieve the file SAMPLE. Enter the label *Zip* in cell F1, and enter the following zip codes as values in the cells indicated: F2—*03755*, F3—*23113*, F4—*79602*, F5—*03102*, and F6—*06430*. The values you entered in cells F2, F5, and F6 won't appear with a leading zero.

To correct the problem of the missing zero and return a zip code that's a label, enter the following formula in cell G2 and copy cell G2 to range G3..G6:

@RIGHT(“0”&@STRING(F2,0),5)

The formula @STRING(F2,0) converts the contents of cell F2 into a label and displays zero decimal places. The label “0” is concatenated with the label returned by the @STRING formula and thus returns the label *03755*. Then the @RIGHT function returns the five rightmost characters in that label. That strips off an unnecessary preceding zero for the zip code of Midlothian, Va., but leaves a necessary zero, such as in the zip code for Hanover, N.H.

Now you need to convert the column of formulas into values. To do so, select /Range Value. Specify range G2..G6 as the From range and cell G2 as the To range. The cells now contain the results of the @RIGHT formulas, not the formulas themselves. Finally, select /Copy and specify range G2..G6 as the From range and cell F2 as the To range. The *Zip* field of the database now contains zip codes that are labels, not values, as shown in the figure below:



	A	B	C	D	E	F
1	Number	Name	Street	Town	State	Zip
2	43	Higenbotham	307 Wentworth Street	Hanover	NH	03755
3	135	Pease	1643 Porter's Mill Lane	Midlothian	VA	23113
4	274	Hill	1313 Mockingbird Lane	Abilene	TX	79602
5	97	Anselm	12 Saints Boulevard	Manchester	NH	03102
6	158	Hirsch	495 Old Hickory Road	Fairfield	CT	06430

Now you can erase range G2..G6.

4 Use the Worksheet Titles command.

A database usually contains more columns and rows than you can display at one time. While you can use the cursor-movement keys to roam around your data, you might forget what an entry means once the field names aren't on the screen. Fortunately, you can use the Worksheet Titles Horizontal command to hold a row or range of rows in place while you work with your database.

To use this command, move the cell pointer to any cell in the row directly below the row containing the field names. Then select /Worksheet Titles Horizontal. When you move the cell pointer down through the database, the field names remain in view. For example, retrieve the file SAMPLE. Move the cell pointer to cell A2 and select /Worksheet Titles Horizontal. Press the PageDown key a few times, and you'll see that the row of field names remains visible at the top of the screen. When you wish to unfreeze the titles, select /Worksheet Titles Clear.

A related command, Worksheet Titles Vertical, allows you to freeze columns so that they remain in place as you peruse columns that are ordinarily off the screen. Just position the cell pointer in any cell in the column just to the right of the column, or columns, that you want to hold in place. Then select /Worksheet Titles Vertical.

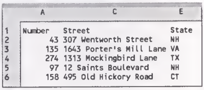
Sometimes using either of the above commands isn't enough. When you need to freeze both columns and rows, use the Worksheet Titles Both command. Position the cell pointer in the cell that is directly to the right of the column you want to freeze and directly below the row you want to freeze. Then select /Worksheet Titles Both.

5 Print your database creatively.

Don't overlook the value of brevity when presenting your data. Rather than print an entire database, extract just a portion of the database for printing, or use the @D functions or a Data Table command to generate a page of summary statistics.

If a concise analysis of the database won't suffice, perhaps you can print only selected columns. To do this, you use the Worksheet Column Hide command. For example, retrieve the file SAMPLE. Suppose you decide that you need a printout containing only columns A, C, and E. You can hide columns B and D so that they don't appear on your printout.

To do so, select /Worksheet Column Hide. Specify any cell in column B. Repeat the command and specify any cell in column D. As soon as you hide a column, *1-2-3* removes it from the display and the remaining columns are displayed in their place. Your worksheet should look just like the one shown to the right.



	A	C	E
1	Number	Street	State
2	43	307 Wentworth Street	NH
3	135	1643 Porter's Mill Lane	VA
4	274	1313 Mockingbird Lane	TX
5	97	12 Saints Boulevard	NH
6	158	495 Old Hickory Road	CT

Now you can issue the appropriate commands to print the data. When you're ready to redisplay the columns, select /Worksheet Column Display. *1-2-3* immediately displays all of the hidden columns, which are marked with an asterisk, and prompts you to specify the one you want to redisplay. Move the cell pointer to column B and press Return. To redisplay column D, repeat the process. Alternatively, you can have *1-2-3* redisplay both columns at once. Just select

/Worksheet Column Display and specify range B1..D1.

If you're convinced that you need to print the entire database, use the /Print Printer Options Setup command to enter a setup string that instructs the printer to print in a special mode. The string \015 produces compressed type on many dot-matrix printers, for example. Try using that code. If it doesn't work, consult your printer manual. Finally, when you've finished using a special printing mode, use the setup string that resets your printer to print in normal mode again.

6 Keep ranges in working order.

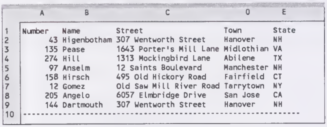
Adding a record to a database is easy. Remembering to redefine the Data-Range and the Input range after adding the record is difficult. And if you forget to adjust those ranges after adding records, *1-2-3* won't process the additional records when you sort or query the database.

Avoid failed sorts and queries by letting *1-2-3* automatically adjust the ranges for you. Just add a row, each cell of which contains a backslash and a hyphen (\–). This produces a repeating dashed line, marking the bottom row of the database. Then respecify the Data-Range or the Input range.

To test this for yourself, retrieve the file SAMPLE. Position the cell pointer on cell A7, select /Worksheet Insert Row, and press Return. Enter \– in cell A7 and copy cell A7 to range B7..E7. Now select /Data Sort Data-Range, specify range A2..E7, and select Quit. Select /Data Query Input, specify range A1..E7, and select Quit. *1-2-3* now knows that your database includes the row containing the dashed lines.

Suppose you decide to add three new records to the database. Just position the cell pointer anywhere in row 7, select /Worksheet Insert Row, press the DownArrow key two times, and then press Return. *1-2-3* inserts three blank rows between the last record containing data and the dashed line.

Now you're free to enter the three additional records. If you wish, enter the records that are on rows 7, 8, and 9 of the figure, shown below. Now if you select /Data Sort Data-Range or /Data Query Input, you'll see that *1-2-3* has already adjusted those ranges to include the new records:



```
        A          B                C                   0          E
1  Number    Name        Street                    Town        State
2         43 Higenbotham 307 Wentworth Street      Hanover     NH
3        135 Pease       1643 Porter's Mill Lane   Midlothian  VA
4        274 Hill        1313 Mockingbird Lane     Abilene     TX
5         97 Anselm      12 Saints Boulevard       Manchester  NH
6        158 Hirsch      495 Old Hickory Road      Fairfield   CT
7         12 Gomez       Old Saw Mill River Road   Tarrytown   NY
8        205 Angelo      6057 Elmbridge Drive      San Jose    CA
9        144 Dartmouth   307 Wentworth Street      Hanover     NH
10 ------------------------------------------------------------
```

Remember, the row of dashed lines is an actual data record. In *1-2-3* Releases 2.01 and 2.2, if you sort the database in ascending order, the record of dashed lines remains at the bottom of the database. However, if you sort in descending order, the record of dashed lines shuffles to the top of the database. Therefore, you'll want to re-sort the database in ascending order before you add any additional records.

Note that if you use *1-2-3* Release 2.01 or 2.2 and you used the Install program to change the collating sequence to ASCII, the opposite record shuffling occurs. The same holds true if you use *1-2-3* Release 3 and any collating sequence. That means that if you sort in ascending order, the record of dashes moves to the top. And if you sort in descending order, the record of dashes remains at the bottom.

Also, remember to insert only as many blank rows as you have additional records. You don't want the database to contain blank records, because they may affect certain calculations. Similarly, if you use any @functions that require you to specify a list of items to analyze, don't include the dashed-line record in the list. Otherwise, calculations involving such functions as @AVG and @COUNT will return inappropriate results. Also, if you use a macro that requires you to specify the number of records, don't include the dashed-line record in your count.

7 Separate field names from data records.

It's tempting to use a dashed line to separate the row containing field names from the rows of data records. In general, you must avoid doing so because *1-2-3* treats the dashed line as a data record and sorts it along with the rest of the database.

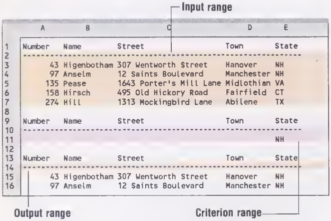
However, you can create field names that are made up of dashes and a label. Then you'll place a copy of the field names above the dashed row. You create these field names with dashes by using the backslash label prefix (\) followed by a series of dashes and a descriptive field name. The backslash character is usually used to generate a repeating label. As you'll see in a moment, this prefix also confines the display of a long label to the current width of the cell.

Retrieve the file SAMPLE. Position the cell pointer on cell A2, select /Worksheet Insert Row, and press Return. In each cell in range A2..E2, type a backslash followed by at least the same number of dashes as the current column width. Then type a descriptive label at the end of the dashes and press Return. For example, in cell A2, which has a column width of 9, type \---------*Number*. Follow this same process for the cells in range B2..E2.

Now set up Criterion and Output ranges in order to perform data queries. First, select /Range Erase and specify range A9..E12. Then select /Copy and specify range A1..E2 as the From range and cell A9 as the To range. Repeat the same process to copy range A1..E2 to cell A13.

Next, set up the Data-Range and the Input, Criterion, and Output ranges. Select /Data Sort Data-Range, specify range A3..E7, and select Quit. Then select /Data Query Input and specify range A2..E7. Select Criterion and specify range A10..E11, and select Output and specify range A14..E14. Finally, select Quit.

Now, if you wish, you can re-sort the database or enter criteria on row 11 and extract data. The following figure shows the database sorted in ascending order according to *Number* and also shows the records that *1-2-3* extracted when *NH* was the criterion.



```
         A          B                         C             D         E
1   Number    Name          Street                   Town        State
2   ---------------------------------------------------------------------
3          43 Higenbotham 307 Wentworth Street      Hanover     NH
4          97 Anselm      12 Saints Boulevard       Manchester  NH
5         135 Pease       1643 Porter's Mill Lane   Midlothian  VA
6         158 Hirsch      495 Old Hickory Road      Fairfield   CT
7         274 Hill        1313 Mockingbird Lane     Abilene     TX
8
9   Number    Name          Street                   Town        State
10  ---------------------------------------------------------------------
11                                                               NH
12
13  Number    Name          Street                   Town        State
14  ---------------------------------------------------------------------
15         43 Higenbotham 307 Wentworth Street      Hanover     NH
16         97 Anselm      12 Saints Boulevard       Manchester  NH
```

When you use this somewhat unorthodox technique of creating field names that consist of dashes and a label, keep a few pointers in mind.

First, don't include the descriptive field names, located in row 1 of the example, in the Input range. These labels are for display only and are not part of the actual database.

Second, to create Criterion and Output ranges, copy the row of dashed lines to the areas where you'll locate those two ranges. Despite their odd appearance, the dashes are the legitimate field names. You may also choose to copy the descriptive field names, located in row 1 of the example, to the Criterion and Output range areas, but don't include them when you specify the range.

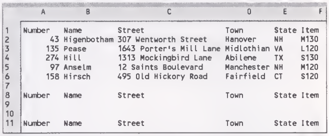
Third, remember that a field name made up of a series of dashes and a label may exceed the 15-character limit for a range name. Therefore, you may not be able to use this tip along with the technique that described how to assign the field names as range names for the corresponding fields in the first data record (tip 2).

8 Use wild cards in queries.

Querying a large database can take a substantial amount of time. In fact, the more complex the query, the longer *1-2-3* takes to process the records. By using wild card characters in the criteria, you can make your query less specific and save time. It's true that *1-2-3* may return more records than you want, but you can easily scan the list for the specific record you seek.

The available wild card characters are the asterisk (*), which matches all characters to the right of the asterisk; the question mark (?), which matches a single character; and the tilde (~), which matches all labels *except* the one following the tilde.

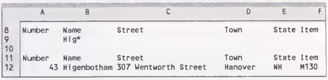
To test these wild card characters, retrieve the file SAMPLE. Let's add a column to the database. Enter the label *Item* in cell F1 and then copy cell F1 to cells F8 and F11. Now enter the item numbers shown in range F2..F6 of the following figure.



```
         A          B                         C             0         E      F
1   Number    Name          Street                   Town        State Item
2          43 Higenbotham 307 Wentworth Street      Hanover     NH     M130
3         135 Pease       1643 Porter's Mill Lane   Midlothian  VA     L120
4         274 Hill        1313 Mockingbird Lane     Abilene     TX     S130
5          97 Anselm      12 Saints Boulevard       Manchester  NH     M120
6         158 Hirsch      495 Old Hickory Road      Fairfield   CT     S120
7
8   Number    Name          Street                   Town        State Item
9
10
11  Number    Name          Street                   Town        State Item
```

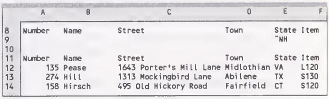
Next, tell *1-2-3* the location of the Input, Criterion, and Output ranges. Select /Data Query Input and specify range A1..F6. Select Criterion and specify range A8..F9, and select Output and specify range A11..E11. Finally, select Quit.

Now let's say you want to extract all records that match the name *Higenbotham*. Enter the criterion *Hig** in cell B9. Select /Data Query Extract. The record for Higenbotham appears in the Output range, as shown below:



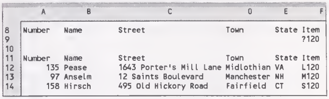
```
         A          B                         C             D         E      F
8   Number    Name          Street                   Town        State Item
9             Hig*
10
11  Number    Name          Street                   Town        State Item
12         43 Higenbotham 307 Wentworth Street      Hanover     NH     M130
```

If you want to extract all records that do not contain the abbreviation *NH* in the *State* field, first erase the criterion in cell B9. Then enter the criterion *~NH* in cell E9. Press the Query key, and the records for Pease, Hill, and Hirsch appear in the Output range, as shown below:



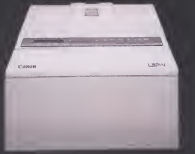
```
         A          B                         C             0         E      F
8   Number    Name          Street                   Town        State Item
9                                                                ~NH
10
11  Number    Name          Street                   Town        State Item
12        135 Pease       1643 Porter's Mill Lane   Midlothian  VA     L120
13        274 Hill        1313 Mockingbird Lane     Abilene     TX     S130
14        158 Hirsch      495 Old Hickory Road      Fairfield   CT     S120
```

Finally, let's say you need to see the records of those people who ordered item number 120, which comes in small, medium, and large. Consequently, that item number can be S120, M120, or L120. First, erase the criterion in cell E9. Then enter the criterion *?120* in cell F9 and press the Query key. The records for Pease, Anselm, and Hirsch appear in the Output range, as shown below.



```
         A          B                         C             0         E      F
8   Number    Name          Street                   Town        State Item
9                                                                      ?120
10
11  Number    Name          Street                   Town        State Item
12        135 Pease       1643 Porter's Mill Lane   Midlothian  VA     L120
13         97 Anselm      12 Saints Boulevard       Manchester  NH     M120
14        158 Hirsch      495 Old Hickory Road      Fairfield   CT     S120
```

Scott Tucker is coauthor of Inside Lotus 1-2-3 Macros, *published by Simon and Schuster, 1989.*



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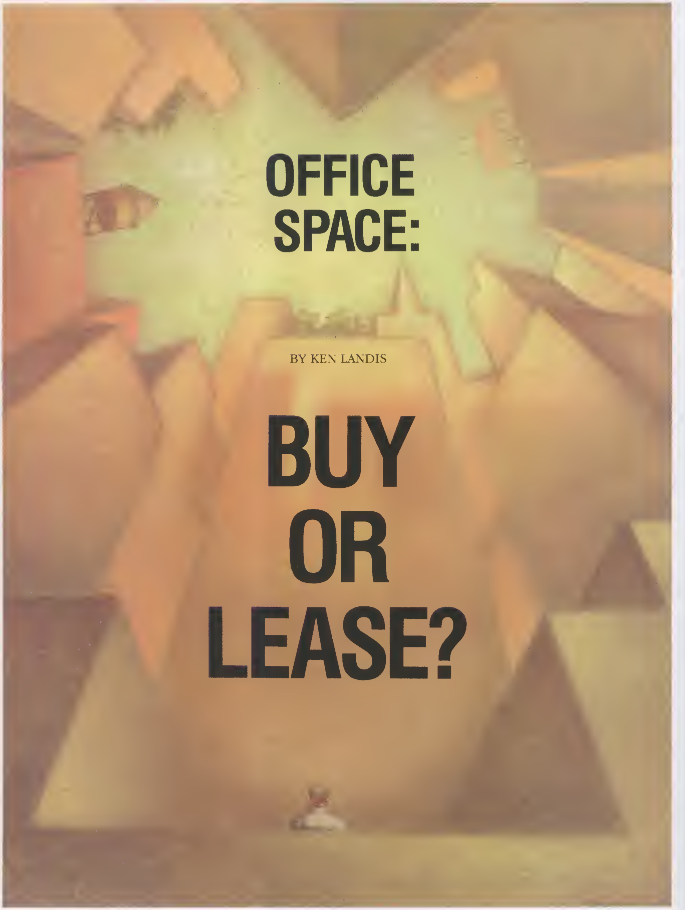
OFFICE SPACE:

BY KEN LANDIS

BUY OR LEASE?



TOM SCIACCA

There's a lure to buying your building, but does it make sense economically?

The 1980's will be remembered by many business owners as the decade when commercial real estate prices in many regions of the country boomed—then busted. Among the hardest hit by this abrupt reversal were small businesses that risked their capital to buy rather than lease property. It looked simple: You merely had to come up with a modest down payment, make mortgage payments, and then, when you were ready, sell at a handsome profit.

Unfortunately, things didn't turn out that way. Property-value increases of 20%, 30%, or even 50% per year are sometimes sustainable over the short term, but in the longer term, prices inevitably stabilize, or even collapse. In many areas where prices have flattened or dropped, there is now a buyer's market, and you may be able to find a home for your business that turns out to be a good investment.

A QUESTION OF STATUS

The model described in this article works in *1-2-3* Releases 2.01 and higher and *Symphony* Release 2.0. But before examining the details of the worksheet, let's discuss what kind of company this analysis works for. Even if the worksheet indicates that buying is preferable to leasing, owning real estate may not always be an advantage for a publicly held company. The reason is depreciation.

The Internal Revenue Code requires you to depreciate a building on a straight-line basis over a period of 31.5 years. The land the building occupies does not depreciate. Internal equipment, such as air conditioners, water heaters, and so forth, can be depreciated much faster than the building itself. To keep things from getting too complex, the model assumes that this amount is minimal. Therefore, the model depreciates the building as a whole over 31.5 years rather than breaking it into its components and depreciating them individually.

Thus, if you bought a building for $315,000, it would depreciate at the rate of exactly $10,000 per year. The $10,000 per year depreciation is counted as an expense that would appear on your business's income statement, lowering your earnings. If your company is publicly held, this can be a problem because earnings are likely to be the primary determinant of your stock price.

If your company is privately held, then your concern is more likely to be with cash flow rather than with earnings. Since depreciation is a noncash expense, it doesn't take money out of your pocket. It does, however, lower your taxes at your marginal tax rate. So, buying a building always helps a privately held company by reducing its taxes, but it can hurt a publicly held company by reducing its earnings. The analysis presented in this article is oriented toward privately held companies driven by cash flow.

For a more detailed description of how depreciation affects a company's earnings and cash flow, see "A Spreadsheet Business Planner" on page 38 of this issue.

THE WORKSHEET

Will buying your office space be a good investment? This worksheet gives you the framework to answer that question. You can build the model by using the instructions in the setup box on page 57, although doing so isn't necessary to follow the remainder of this article.

The worksheet assumes that at the end of the period covered by your analysis, you sell the building and take out your equity. The model compares the cash flow associated with this alternative to the cash flow that results from leasing the same property and determines which is greater.

The model uses a blended, or average, interest rate as one of its inputs. Commercial mortgages almost always float, or vary, based on changes in the prime lending rate or Treasury bill rate. Since no one knows the course interest rates will take over an extended horizon, the worksheet asks you to estimate what the blended rate will be over the period of the analysis. That estimate is entered in cell E13.

The worksheet is divided into two sections: inputs and analysis. Inputs, located in column E, are divided into three types: general, buy-specific, and lease-specific. The first general input is the analysis horizon, which is expressed in years and is simply a measure of how long you expect to stay in the office space, whether you buy or lease it. The second is your business's marginal tax rate, which includes federal, state, and city taxes.

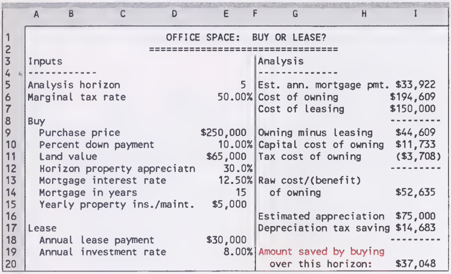
The Buy section includes the seven inputs, as follows:

1. Purchase price—the full cost of buying the building, including the land.

2. Percent down payment—the amount of capital that you will have to put into the building to obtain a mortgage, expressed as a percentage of the purchase price. The lower your down payment, the higher your mortgage payment will be.

3. Land value—the appraised value of the land the building occupies, or your share of the land if you're buying a professional cooperative. The IRS doesn't allow you to depreciate land, only the building. This example assumes that about 75% of the purchase price is the structure itself.

4. Horizon property appreciation—an estimate of the appreciation you expect on the property. This value is expressed as a percentage that covers the entire period of



```
      A     B          C          D          E    F      G              H           I
 1                        OFFICE SPACE:  BUY OR LEASE?
 2                   ================================
 3   Inputs                                      |Analysis
 4   ------------                                |--------------
 5   Analysis horizon                          5 |Est. ann. mortgage pmt. $33,922
 6   Marginal tax rate                    50.00% |Cost of owning         $194,609
 7                                               |Cost of leasing        $150,000
 8   Buy                                         |                      ---------
 9     Purchase price                 $250,000   |Owning minus leasing    $44,609
10     Percent down payment               10.00% |Capital cost of owning  $11,733
11     Land value                      $65,000   |Tax cost of owning     ($3,708)
12     Horizon property appreciatn        30.0%  |                      ---------
13     Mortgage interest rate             12.50% |Raw cost/(benefit)
14     Mortgage in years                    15   |  of owning             $52,635
15     Yearly property ins./maint.      $5,000   |
16                                               |Estimated appreciation  $75,000
17   Lease                                       |Depreciation tax saving $14,683
18     Annual lease payment            $30,000   |                      ---------
19     Annual investment rate              8.00% |Amount saved by buying
20                                               |  over this horizon:    $37,048
```

the analysis. The example assumes that the office space in question will appreciate a total of 30% over a five-year period.

5. Mortgage interest rate—your estimate of the blended interest rate.

6. Mortgage in years—the contractual length of the mortgage. Most commercial mortgages run 10 to 15 years. Enter the term of the mortgage you would use to acquire the property, even if your horizon for analysis is shorter.

7. Yearly property insurance and maintenance are lumped into the same cell. The first is the premium you pay to cover the building in case of fire, water damage, or other catastrophes. Maintenance includes all money spent on upkeep and repairs.

The remaining two variables are lease-specific. They are the annual lease payment for the office and your estimated annual investment rate. The latter variable measures the rate your capital will earn if it is not used as a down payment. Again, this estimate is a blended average of your rate of return over the horizon of analysis. You can estimate a money market rate or use your business's own rate of return.

ANALYSIS

The analysis formulas of the template, found in column I, compare the gross difference between buying and leasing. The model first uses the @PMT function to calculate your estimated annual mortgage payment. The payment is based on the value of the mortgage (purchase price less down payment), the mortgage rate you entered in cell E13, and the term of the mortgage in years (cell E14). This estimated mortgage payment serves as a point of comparison with the annual lease payment in cell E18.

The model uses the estimated annual mortgage payment to calculate the cost of owning the property over the horizon you specify in cell E5. If the mortgage extends beyond the horizon, the formula in cell I6 multiplies the estimated annual mortgage payment by the horizon. If the length of the mortgage is less than the horizon, the formula in cell I6 multiplies the mortgage payments by the number of years in the mortgage. For example, if the term of your mortgage is 15 years and your horizon is 20 years, this cell counts only 15 mortgage payments, not 20.

Added to the mortgage payment is the yearly insurance and maintenance cost multiplied by the horizon. This payment is always multiplied by the horizon because it continues to be incurred even after the mortgage is paid in full.

The cost of the lease (cell I7) is the number of years used in the analysis times the yearly lease cost. Cell I9 calculates the difference between the cost of buying (cell I6) and the cost of leasing (cell I7).

To approximate the cost of capital (cell I10), the model first multiplies the down payment percentage (cell E10) by the purchase price (cell E9) to arrive at the dollar amount of the down payment. It then compounds this amount by using the investment rate (cell E19) over the horizon period (cell E5) and then subtracts the down payment. This figure represents the interest you would have earned if you had leased the office and invested the cash instead of making a down payment.

The tax cost of owning (cell I11) requires the most complicated formula in the model. Both owning and leasing provide tax deductions against your business's income. The lease payments in cell I7 are 100% deductible. The maintenance and insurance costs included in cell I6 are fully deductible. But only the interest portion of the mortgage is deductible, so the formula uses the @PV function to determine just how much interest has been paid at any given point in the mortgage. Cell I11 then compares the leasing and owning deductions and multiplies the difference by the company's marginal tax rate to arrive at the tax cost of owning.

In the figure, the tax cost is negative—meaning that it's actually a tax benefit. This is not unusual for a relatively short horizon because the tax-deductible interest payments on the mortgage are concentrated at the front end. This can change for a longer horizon. But for the five-year horizon in the example, the business would pay $3,708 less in taxes by owning than by leasing.

The three variables in range I9..I11 represent the extra costs associated with buying your office: the extra out-of-pocket payments, the opportunity cost of the capital used for the down payment, and the extra taxes associated with ownership. These amounts are usually greater than zero, although it's possible for the first and the third to be negative numbers. These three variables, summed in cell I14, represent the raw cost of owning.

From this raw difference, the model deducts equity gain and the depreciation tax savings to arrive at the true cost difference. Equity gain (cell I16) is the estimated property appreciation over the analysis horizon. It is calculated by multiplying the purchase price (cell E9) times your appreciation estimate (cell E12).

To calculate depreciation tax savings (cell I17), the model first finds the difference between the purchase price (cell E9) and the land value (cell E11) to determine the cost of the building. It divides this cost by 31.5 to get the amount of depreciation that can be taken each year. It multiplies that yearly depreciation by your business's marginal tax rate (cell E6) to develop the yearly cash flow savings. Then it multiplies yearly cash flow savings by the horizon (cell E5) to produce the total tax savings for the period of the analysis.

Finally, the model subtracts the estimated appreciation, or equity gain (cell I16), and the depreciation tax savings (cell I17) from the raw cost (cell I14) to calculate the total cost or benefit of buying office space (cell I20). If this result is negative, then buying a building for your business makes sense, and the string-returning formula in cell G19 displays the message *Amount saved by buying*. If the result is positive, then buying will cost you more than leasing, and the formula in cell G19 displays *Amount saved by leasing*. The formula in cell I20 displays the amount saved in either case.

To see how this formula and the other formulas in the model work, enter *10* as the analysis horizon in cell E5, while holding all the other variables constant. This means that, with all other conditions being equal, you expect the building to appreciate 30% in 10 years rather than in five years.

In this scenario, the raw cost of owning has increased dramatically—but it hasn't been offset by any corresponding increase in appreciation of the building. Depreciation tax savings double, but this isn't enough to offset the increase in raw cost. Leasing is now the more viable option, and cell G19 changes to reflect this fact.

Change the appreciation in cell E12 from 30% to 60%, and the model once again indicates that buying is the better option. This exercise illustrates the pitfall of overestimating the appreciation on the property you may purchase.

A FINAL WORD

With only these 11 variables, you can quickly see if buying office space makes sense for your business. The fluctuating nature of commercial interest rates makes it impossible to know the exact cost of buying office space, but the blended interest rate that the model uses makes it possible to come up with a reasonably close estimate.

As the economy and interest rates change, so do property appreciation, mortgage rates, lease costs, and the like. This worksheet crystallizes the effect of each economic variable. By holding all but one of the variables constant, you can perform sensitivity analysis to gauge the effect of changes in your estimates. ■

Ken Landis has written about microcomputers and finance since 1978 and is a frequent contributor to LOTUS

HOW TO SET UP THE BUY-OR-LEASE WORKSHEET

1. Releases

This model works in *1-2-3* Releases 2.01, 2.2, and 3, and in *Symphony* Release 2.0.

2. Default settings

Format: Currency 0

1-2-3:	/Worksheet Global Format Currency, enter *0*
Symphony:	MENU Settings Format Currency, enter *0*, select Quit

3. Column widths

Column	Width
A	3
F	1
G	14

For example, to set the width of column A, place the cell pointer in column A and select

1-2-3:	/Worksheet Column Set-Width, enter *3*
Symphony:	MENU Width Set, enter *3*

4. Cell formats

Format	Range
General	E5, E14
Percent 1	E12
Percent 2	E6, E10, E13, E19

For example, to assign the General format to cell E5, select

1-2-3:	/Range Format General, indicate cell E5
Symphony:	MENU Format General, indicate cell E5

5. Labels

Enter the labels shown in the figure. Begin the label in cell D1 with three spaces. Begin the labels in ranges A9..A15, A18..A19, and in cells G14 and G20 with two spaces. Do not enter the label in cell G19 (in red type). To create the dashed lines, enter a backslash followed by a minus sign or an equal sign, then copy the cell as necessary. To create the vertical line, enter an apostrophe followed by a split vertical bar ('¦) in cell F3 and copy cell F3 to range F4..F20.

6. Values

Enter the values shown in range E5..E19.

7. Formulas

Enter the following formulas:

Cell	Formula
I5	@PMT(E9*(1-E10),E13,E14)
I6	+I5*(@IF(E5>E14,E14,E5))+E15*E5
I7	+E18*E5
I9	+I6-I7
I10	(E9*E10)*(1+E19)^E5-(E9*E10)
I11	(I7-(I5*@IF(E5>E14,E14,E5)-(E9*(1-E10)-@PV(I5,E13,E14-@IF(E5>E14,E14,E5))))-E15*E5)*E6
I14	@SUM(I9..I11)
I16	+E9*E12
I17	((E9-E11)/31.5)*E6*E5
G19	+"Amount saved by "&@IF(I14-I16-I17<0,"buying","leasing")
I20	@ABS(I14-I16-I17)

Now the #1 spreadsheet gives

Lotus® 1-2-3® Release 2.2: The All-Purpose 1-2-3

What if we took the world's leading spreadsheet — the business standard for seven years — and made it more powerful...easier to use and customize...yet very compact and extremely fast? That's what 1-2-3 Release 2.2 is all about.

Release 2.2 lets you build more flexible worksheets and applications. With file linking, you can create links between worksheets in memory and on disk, so you can make better use of your PC's memory.

We've also built *Allways*™, The Spreadsheet Publisher, right in, to give you true presentation-quality output. Allways offers a WYSIWYG display, up to 8 different fonts, shading, boxes and gridlines. Plus Release 2.2 lets you combine text and graphs on the same page.

And Release 2.2 lets you get more done in less time with "minimal recalc," so only the formulas or cells affected by a change in the worksheet are recalculated.

You'll also find an undo command for easier error recovery; a global search and replace function that makes changes automatic; a new built-in add-in manager allowing direct access to hundreds of add-in products used to customize 1-2-3. Plus new macro commands and macro enhancements.

For convenience, Learn mode records keystrokes while you work to simplify writing macros; and there are 8 new setting sheets that let you view your spreadsheet settings on a single screen.

If you are a DOS PC user, Lotus 1-2-3 Release 2.2 will give you everything you expect from 1-2-3...and more.

System Requirements: All types of IBM PCs & Lotus-certified compatibles running DOS 2.2 or higher. Minimum 320K RAM (512K required with Allways).

Lotus 1-2-3 Release 3: The Advanced 1-2-3

Release 3 gives you a whole new way to take advantage of the power built into your PC. Lotus' new 3-dimensional technology lets you more easily manage spreadsheet data and complex applications, while giving you unparalleled flexibility to analyze and organize information.

The new multi-sheet, multi-file design, known as true 3D, lets you move quickly and easily between worksheets, viewing several sheets or files at the same time.

With true 3D and advanced file linking, Release 3 now lets you link complex formulas across worksheet files — and link multiple cells — then update them all with a single command. Consolidating large amounts of data is now easier than ever.

New relational database features enhance your ability to query, analyze and report database information...plus do joins and aggregations. A new "data external" capability lets you access and use non-1-2-3 data from within 1-2-3 without translating or re-keying. We've even included a sample dBASE III® driver.

There are now over 200 graph combinations with a variety of colors, hatching patterns, fonts and text sizes. You can print graphs and text on the same page; print while working on a spreadsheet; print right from the menu with no setup strings; and use a full range of graphics and laser printers, including PostScript® printers. And Release 3 is fully customizable with the Lotus Add-in Toolkit.

For the new dimension in spreadsheet power and performance, Lotus 1-2-3 Release 3 is your best choice.

System Requirements: 286/386 PCs running DOS 3.0 or higher or OS/2 1.0 or higher. 1Mb RAM required with DOS, 3Mb RAM with OS/2. Hard disk required.

Lotus 1-2-3/G: The Graphical 1-2-3

Lotus 1-2-3/G™ is the only spreadsheet that gives you the power and ease-of-use of 1-2-3 in the graphical user interface (GUI) environment of OS/2® Presentation Manager.™

1-2-3/G will seem instantly familiar, because it preserves the 1-2-3 commands and keystrokes you already know. It also gives you everything you expect from GUI, including pull-down menus, multiple windows, full mouse support and a "What-You-See-Is-What-You-Get" display.

What's more, 1-2-3/G *improves on* GUI, with features like color palettes and font previews in dialog boxes, and direct manipulation of objects on the screen. Plus any function can be performed using either the keyboard, the mouse, or both.

1-2-3/G delivers the powerful features found in Release 3, like 3D worksheets, file linking to files in memory or on disk, external data access and relational database capabilities, plus new and improved business graphics. And you can print it all out with presentation-quality results.

Our new goal-seeking technology, *Solver,* takes you beyond "what if"...to show you "how to" achieve desired results, based on the variables in your worksheet. Solver quickly presents your alternatives — even the optimal answer. For example, the production mix that will maximize profit.

Plus, 1-2-3/G takes full advantage of the large memory and multi-tasking capabilities of OS/2. And it supports Dynamic Data Exchange, so you can exchange live data with other OS/2 applications.

Simply put, 1-2-3/G gives you the best of 1-2-3 *and* the best of GUI.

System Requirements: IBM PC AT, PS/2 models 50Z, 60, 70, P70, 80, Compaq 286, 386 or 100% compatibles. OS/2 1.1 or higher. Minimum 4Mb RAM.

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	1-2-3 Release 2.2	1-2-3 Release 3	1-2-3/G
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Database	• Flatfile database	• Relational database • External data access	• Relational database • External data access
Graphics	• Easy to create a variety of high-impact graphs • Graph Group	• Over 200 graph options • HotView graph window • Instant Quick Graph	• Improved graphics • Graph gallery • Multiple graph windows
Output	• Presentation-quality results on over 90 printers • Print text/graphs on same page • Built-in spreadsheet publishing	• Presentation-quality output • Print text/graphs on same page • Print directly from the menu	• Presentation-quality output • Print text/graphs on same page • Print preview • WYSIWYG display

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First Last Initial

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City ______________ State ______________ Zip ______________

Daytime Phone (   ) ______________________________
Area Code

XAI

Product	Qty.	Media/Disk Type	Part No.	Price	Total
1-2-3 Release 2.2	________	5.25″	9100	$150	________
Upgrade:	________	3.5″	9105	$150	________
1-2-3 Release 3	________	5.25″	9130	$150	________
Upgrade:	________	3.5″	9135	$150	________
1-2-3/G	________	5.25″	9190 (9193)	$150 ($75†)	________
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Please allow 2-3 weeks for delivery.

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☐ Purchase Order (Original P O *must* accompany this form Minimum purchase order amount is $500)
☐ American Express
☐ Visa
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Credit Card ________________ Exp Date ____

Signature ______________________________ Date ______________
Required for all credit card orders

IMPORTANT: Enclose: (1) One original 1-2-3- System Disk or Backup System Disk per upgrade ordered; (2) Completed Order Form; (3) Payment.

†If you have already purchased 1-2-3 Release 2.2 or 1-2-3 Release 3, you can upgrade to 1-2-3/G at a special *reduced rate* of just $75. Offer valid through 9/30/90. Select media version on Order Form and enclose $75 payment with your original Release 2.2 or Release 3 System Disk as proof of purchase.

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A TOUR THROUGH PRINTGRAPH

Knowing all your options is key to successful graph printing.

BY KEN SAUL

Building a graph is only half the battle. Once you finish writing catchy titles and specifying ranges and legends, it's time to print your work. And that calls for PrintGraph.

This article takes you on a grand tour through all of the *1-2-3* and *Symphony* PrintGraph settings. You'll learn how to select a printer, rotate a graph, and choose a font, among other things. In addition, if you're a *1-2-3* Release 2.2 or Release 3 user, you'll want to review the box on page 65 that describes the new graph-printing features in those programs and shows some sample printouts.

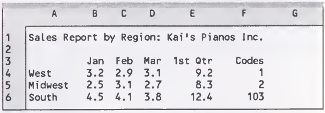
Because the focus of this article is printing graphs, let's assume that your printer is capable of producing graphics and that you have correctly used the Install program to load the necessary graphics driver for it. Furthermore, let's assume that you copied the PrintGraph files to your *1-2-3* or *Symphony* subdirectory when you first installed the program. If any of these conditions are not met, you won't be able to print graphs.

Ken Saul is a manufacturing engineer with Hewlett-Packard Co. and a frequent contributor to LOTUS *magazine*

MAKE A GRAPH

To begin, let's enter some data and construct a few simple graphs so that you'll have something to print out in PrintGraph. Figure 1 shows the data used to construct the bar graph in figure 2 and the pie chart in figure 3.

To construct the graphs, begin in a blank worksheet. Use the /Worksheet Column Set-Width (in *Symphony*, MENU Width Set) command to assign a column width of 5



```
         A        B    C    D       E          F         G
1  Sales Report by Region: Kai's Pianos Inc.
2
3                Jan  Feb  Mar  1st Qtr     Codes
4  West          3.2  2.9  3.1      9.2         1
5  Midwest       2.5  3.1  2.7      8.3         2
6  South         4.5  4.1  3.8     12.4       103
```

FIGURE 1. The spreadsheet used to create the graphs in figures 2 and 3

ROBERT NEUBECKER

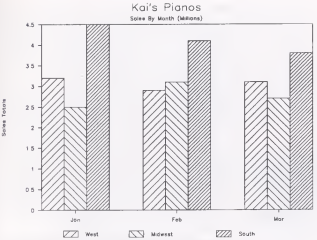


FIGURE 2. A bar graph representing the data in figure 1

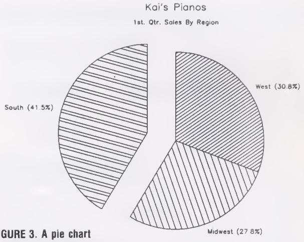


FIGURE 3. A pie chart representing the data in figure 1

to columns B, C, and D. Enter the labels shown in column A and row 3. Select /Range Label Right (in *Symphony*, MENU Range Label-Alignment Right) and specify range B3..F3. Enter the values shown in ranges B4..D6 and F4..F6. Next, enter the formula @SUM(B4..D4) in cell E4. Copy cell E4 to range E5..E6.

Now let's build the bar graph. Select /Graph Type Bar (in *Symphony*, MENU Graph 1st-Settings Type Bar). Select X (in *Symphony*, Range X) and specify range B3..D3. Select A and specify range B4..D4. Select B and specify range B5..D5. Finally, select C and specify range B6..D6.

Next, select Options Titles First (in *Symphony*, select Quit Switch Titles First) and enter the label *Kai's Pianos*. Select Titles Second (in *Symphony*, select Second) and then enter the label *Sales By Month (Millions)*. Select Titles Y-Axis (in *Symphony*, select Y-Axis) and enter the label *Sales Totals*. Select Legend A (in *Symphony*, select Quit Switch Legend A) and enter the label *West*. Select Legend B (in *Symphony*, select B) and enter *Midwest*. Select Legend C (in *Symphony*, select C) and enter *South*. Press Quit View (in *Symphony*, select Quit Quit Preview) to preview the graph, which should look approximately like the bar graph shown in figure 2. When you finish viewing the graph, press any key to return to the menu. Select Save (in *Symphony*, Image-Save) and enter the graph name *BAR*.

It's important to remember to use the *Save* (in *Symphony*, Image-Save) command to save a graph for printing. Many people confuse this command with the Name Create command, which merely saves the graph settings under a particular name. When you save a graph for future printing, *1-2-3* and *Symphony* append the file extension .PIC to the name that you supply and store the image of the graph. In this example, the graph named BAR.PIC is now saved on disk.

Next, create the pie chart. Select Type Pie (in *Symphony*, 1st-Settings Type Pie). Select X (in *Symphony*, Range X) and specify range A4..A6. Select A and specify range E4..E6. Select B and specify range F4..F6. Select Options Titles Second (in *Symphony*, Quit Switch Titles Second), press Escape, and enter *1st Qtr. Sales By Region*. Select Quit View (in *Symphony*, Quit Quit Preview) to view the current graph, which should look similar to the pie chart shown in figure 3. Press any key, select Save (in *Symphony*, Image-Save), and enter the file name *PIE* to save the graph as a .PIC file. Next, select Quit, select /File Save (in *Symphony*, SERVICES File Save), and enter a file name to save the worksheet you just created. Finally, exit

FIGURE 4. The *1-2-3* Release 2.01 PrintGraph menu

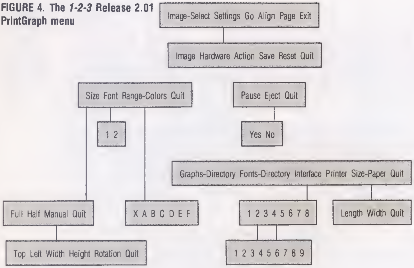


Image-Select Settings Go Align Page Exit
Image Hardware Action Save Reset Quit
Size Font Range-Colors Quit
Pause Eject Quit
1 2
Yes No
Graphs-Directory Fonts-Directory Interface Printer Size-Paper Quit
Full Half Manual Quit
X A B C D E F
1 2 3 4 5 6 7 8
Length Width Quit
Top Left Width Height Rotation Quit
1 2 3 4 5 6 7 8 9

from *1-2-3* or *Symphony*. Then, if you're presented with the System Access menu, select PrintGraph. Otherwise, if you're at a DOS prompt, type *PGRAPH*.

To learn more about the basics of graph building, see "Anatomy of a *1-2-3* Graph" in the January 1989 issue.

Figure 4 contains the complete PrintGraph menu. Let's review each of these menu choices and then print out the graphs you just constructed.

HARDWARE SETUP

Select Settings Hardware, and a menu containing five settings and Quit appears. In general, you'll adjust these settings when you first set up PrintGraph. After that, you'll probably change them only if you have more than one graphics printer attached to your computer or if you change the paper size.

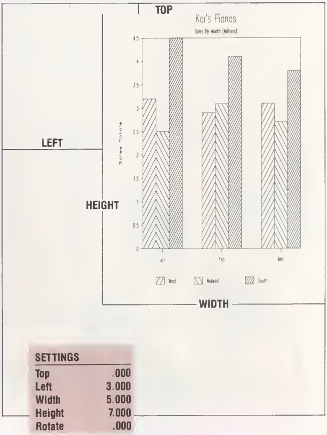
Graphs-Directory. You must specify the subdirectory or drive that contains the graphs you want to print. For example, if the graphs you wish to print are on a disk in drive A, specify A:\. For now, select Graphs-Directory and enter the directory that contains the bar and pie graphs you just created.

Fonts-Directory. Select Fonts-Directory from the menu and specify the subdirectory or drive that contains the PrintGraph program files. On a hard-disk system, you'll usually specify the subdirectory that also that contains your *1-2-3* or *Symphony* program files. If you use a two-disk system, the font files will be on the PrintGraph disk, which you must insert into the drive that you specify in this setting.

Interface. The interface is the route by which the printer receives information from the computer. Your printer is connected to the computer via either a parallel or a serial port. Once you determine the printer interface, select the appropriate option number. Settings 1 through 4 are for printers connected directly to your computer, and settings 5 through 8 are for printers connected to your computer via a network.

If you use a serial printer, you must specify a baud rate in addition to specifying the interface. The baud rate determines how fast the computer transmits data to the

FIGURE 5. By specifying Top, Left, Width, Height, and Rotation settings, you can alter the layout and proportion of a graph. The settings used to generate these three graphs appear in shaded boxes.



SETTINGS	
Top	.000
Left	3.000
Width	5.000
Height	7.000
Rotate	.000

printer or plotter. The rate you select in PrintGraph must match the rate to which the printer or plotter itself is set. In general, you'll want to select the fastest baud rate that your printer can use, up to PrintGraph's limit of 19,200 baud. In addition, your serial printer must be set for eight data bits, no parity, and one stop bit (or two, if you select 110 baud), and handshaking (XON/XOFF) must be enabled. Consult your printer or plotter manual for exact information about these settings.

Printer. When you select Printer, PrintGraph displays a list of the printers that you selected in the Install program. For example, perhaps your computer is connected to a dot-matrix printer and a laser printer. If you specified both of these printers during installation, these two selections appear in PrintGraph. In addition, if a printer that you specified can produce print in various densities, PrintGraph will display that printer's name once for each density. The higher the density, the finer the detail in the printed graph and the longer the printer takes to print the graph. Therefore, you may want to select high-density printing for final reports only.

To select a printer, press the UpArrow and DownArrow keys to move the highlight to your choice and then press the Spacebar. A pound symbol (#) appears to the left of your printer selection. Then press Return to get back to the main menu.

Size-Paper. The default paper size is 8.5 by 11 inches. If your printer uses paper of another size, adjust the Length and Width settings accordingly.

IMAGE OPTIONS

Another group of PrintGraph settings appears under the Settings Image selection. These settings control the size and appearance of the printed graph. Select Quit and then select Image to view the options in the Image menu.

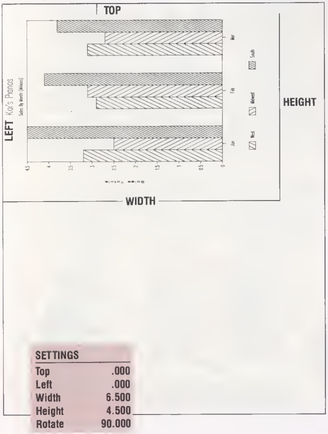
Size. This setting lets you control the size and proportions of the printed graph. Select Full for a full-page graph printed lengthwise on the paper or Half for a half-page graph printed horizontally on the paper.

To specify a custom-size graph, select Manual, which presents you with choices of Top, Left, Width, Height, and Rotation. Top and Left set the top and left margins, respectively, in inches. The Width, Height, and Rotation settings affect the proportions of the graph. Width and Height refer to the graph dimensions—horizontal and vertical—when viewed on paper in the direction the paper feeds into the printer. The graphs in figure 5 show several of these options in use.

To retain the circular shape of a pie chart, you must maintain the standard X-axis to Y-axis ratio of 1.385 to 1. For example, if you specify a height, you'll calculate the width as height times 1.385. If you specify a width, you'll calculate the height as width divided by 1.385.

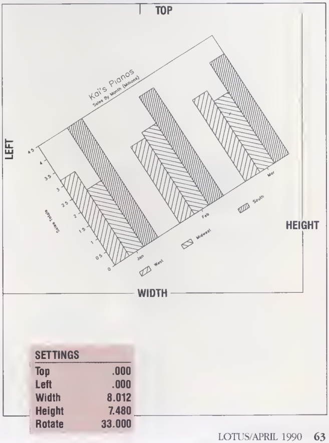
If you specify a Rotation setting of 0, 90, 180, or 270 degrees, the printed graph retains corners that are right angles. However, specifying any other rotation skews the appearance of the printed graph, unless you use the formulas given below to calculate the height and width settings that you'll specify in PrintGraph. To calculate the

Rotate a graph to make room for text . . .



SETTINGS	
Top	.000
Left	.000
Width	6.500
Height	4.500
Rotate	90.000

or to catch the eye of a busy executive.



SETTINGS	
Top	.000
Left	.000
Width	8.012
Height	7.480
Rotate	33.000

value to specify as height, use the following formula:

(desired height*@ABS(@COS(rotation*@PI/180)))
+(desired width*@ABS(@SIN
(rotation*@PI/180)))

To calculate the value to specify as width, use this formula:

(desired height*@ABS(@SIN(rotation*@PI/180)))
+(desired width*@ABS(@COS
(rotation*@PI/180)))

Let's consider a typical example. Suppose you want to print a graph that has a height of 4.7 inches and a width of 6.5 inches. You also want to rotate the graph 33 degrees. Plug these values into the formulas given above. Then enter the resulting formulas, shown below, into any blank spreadsheet cells.

(4.7*@ABS(@COS(33*@PI/180)))+(6.5*@ABS
(@SIN(33*@PI/180)))

(4.7*@ABS(@SIN(33*@PI/180)))+(6.5*@ABS
(@COS(33*@PI/180)))

These formulas return 7.48 for height and 8.01 for width. When you print this graph, you'll specify those values as the height and width settings. The printout appears in figure 5c, which shows a bar graph that has been rotated 33 degrees. Note that the left-margin setting of this graph has been set to 0 to keep the rotated graph from spilling off the right edge of the paper.

Font. PrintGraph allows you to select two fonts that the program uses to print text. The font you specify as font 1 is for the graph's main title, while font 2 is reserved for all other titles, legends, and labels in the graph.

When you select font 1 or font 2, a menu of seven available fonts appears. A font ending in the numeral 2, such as block 2, is darker, or bolder, than a font by the same name ending in the numeral 1.

You may wish to experiment with different fonts. Keep in mind, though, that some fonts, such as the block fonts, are better than others for use on a particular printer. Consult your *1-2-3* or *Symphony* manual for a sample of the available fonts.

Range-Colors. This setting allows you to specify colors that PrintGraph applies to various sections of a graph. Use this setting only if you use a color printer or plotter.

Before you select Settings Image Range-Colors, however, be sure that you have already used the Settings Hardware Printer command to specify the name of your color printer or plotter.

The color you select for the X range applies to the box drawn around the graph, as well as to all other graph elements except the graph data and legends. PrintGraph uses the colors you select for range A through range F to print the data and legends.

When you print a pie chart, the color of each wedge is determined by the value you enter in the B data range of the pie chart and by the color you select in PrintGraph for each range. To explode a wedge of the pie, add 100 to the color value in the B range.

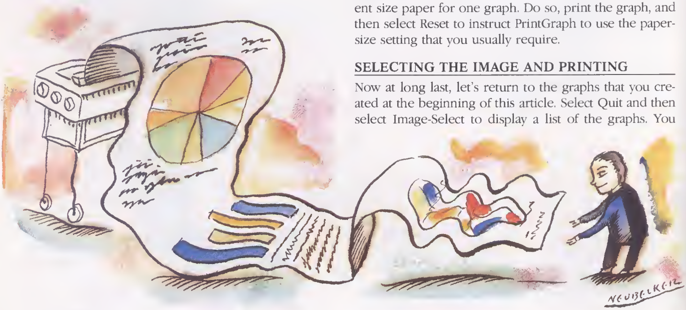
Action Options. The Action setting controls whether PrintGraph automatically advances the paper after printing a graph. If you print graphs on a printer that requires you to insert each sheet of paper manually, select Pause Yes. You'd also select this setting if you wanted to print two half-page graphs on the same sheet. If your printer has an automatic paper-feed feature, select Pause No and Eject Yes.

SAVE AND RESET

You should save the PrintGraph image and hardware settings after you are certain that everything is satisfactory for your system. If you need to change an individual setting to print one graph, you can then change the settings back to those you previously saved by selecting the Reset command. For example, you may want to specify a different size paper for one graph. Do so, print the graph, and then select Reset to instruct PrintGraph to use the paper-size setting that you usually require.

SELECTING THE IMAGE AND PRINTING

Now at long last, let's return to the graphs that you created at the beginning of this article. Select Quit and then select Image-Select to display a list of the graphs. You



should see the graph names BAR and PIE. Press the UpArrow and DownArrow keys to highlight the name of the graph you want to print and then press the Spacebar. A pound sign appears next to the graph name. If you decide not to print that graph, highlight the graph name again and press the Spacebar once. The pound sign will disappear. You may select as many graphs as you wish to print. The order in which you select graphs is the order in which PrintGraph prints them.

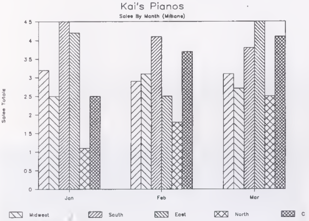
When a particular graph name is highlighted, you can press the Graph key to view the graph on your screen. This feature is particularly handy when you want to get a quick preview of the graph before you print it. Be aware, however, that the previewed graph may not accurately represent the appearance of the printed graph. For example, previewed graphs all appear in block 1 font, regardless of the font you've specified. Once you're through previewing a graph, press any key.

Select both graphs, then press Return. The main menu appears, and you'll notice that the graph names appear under the heading Graph Images Selected (in *1-2-3* Release 2.2, Graphs to Print) in the order that you selected them.

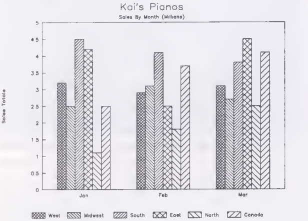
Finally, check that the paper in the printer is positioned at the beginning of a new sheet. Then select Align Go to tell PrintGraph to draw the graphs in the order you selected them. You should get a printout of both the pie and bar graphs. If the printer does not eject the paper, you'll need to select Page to eject it. If you need to cancel printing, press Control-Break. ■

WHAT'S NEW IN RELEASES 2.2 AND 3

PrintGraph in *1-2-3* Release 2.2 looks and behaves exactly as described in the main text of this article. However, the product does contain a few improvements. Perhaps the most important enhancement is in the appearance of printed graphs. For example, graph legends are not truncated or lost, bars in bar graphs do not touch the graph border, tick marks appear on the inside of the graph frame, and X-axis labels do not run into each other. The graphs shown below illustrate some of the differences between bar graphs created in Releases 2.01 and 2.2.



***1-2-3* Release 2.01**

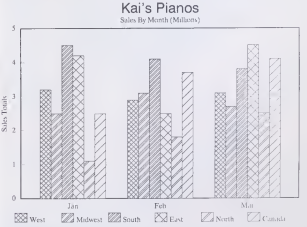


***1-2-3* Release 2.2**

In Release 3 the equivalent of PrintGraph is built into the Print menu. An upcoming article will explore the new graph types and options available in Release 3. In terms of graph printing, there are only a few major differences between Release 3 and Releases 2.01 and 2.2. For example, while Release 3 allows you to select only one image at a time, you can select another image while the first is printing. Depending on the printer you're using, you can specify three font selections from among eight available fonts and type sizes.

Be aware that Release 3 limits graph rotation to 0 or 90 degrees. In addition, to specify a height for a graph, you use increments of a sixth of an inch, which is equivalent to one line of pica type. To specify a width, you use increments of a tenth of an inch.

As you can see in the graph below, Release 3 prints a clearer, sharper image than one produced by Release 2.01 or Release 2.2.



***1-2-3* Release 3**

COLLECTING

How you can consolidate—and display—production data in real time

BY NICHOLAS J. LOSOLE

To remain competitive, more and more companies are turning to computer-integrated manufacturing, or CIM. When combined with such other vital tools as statistical process control and just-in-time-inventory management, CIM can be a powerful assist in reducing the cost of products.

But CIM comes in many shapes and sizes. It can be as simple as the use of bar codes to capture data on the status of parts during manufacture. Or it can be as vast and intimidating as a fully automated factory, in which all operations are linked by the computer. The lesson that many of us have learned is that it pays to implement CIM in small bites, starting with operations that we fully understand and that are already running well. That limits the impact of mistakes. And it's less likely that we'll outpace the work force in its ability to absorb the changes.

The PC and *1-2-3* can be excellent tools for implementing CIM in bite-size pieces. In a recent article, I showed how a macro-driven template can provide an interface that makes it simple for a machine operator to enter data from the factory floor ("To Control Production, Point and Shoot," December, page 38). In this article, I will show how to take the next step by consolidating factory data—whether they are input manually or retrieved automatically—from many sources and presenting it in a useful form.

The macro-driven template described in this article runs in *1-2-3* Releases 2.01, 2.2, and 3. As figure 1 suggests, it produces a table that shows you how many parts were begun, finished, and released for each shift and for each machine, as well as how many hours each machine was busy. The program also allows you to see instanta-

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STEVE DUNWELL/IMAGEBANK

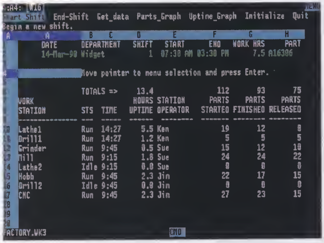
FACTORY DATA

neously a graph of parts production and a graph of machine uptime. You can store the table as a worksheet, call it up, and print it out.

HOW TO USE THE MODEL

The template can be used in two ways. It can read data from ASCII files that are created by data-collection devices, such as hand-held readers or data-collection servers. Or it can read data directly from a data-collection board that is attached to the same PC on which *1-2-3* is running. Some boards that are available are noted in the "Getting Data in Real Time" box on page 73. A board allows data to be collected, displayed, and updated in the *1-2-3* worksheet in real time.

The simplest and least costly way to begin is to use a device that can collect data, store it as ASCII strings, consolidate it into an ASCII file, and dump it onto a PC's disk through a COM port. Most hand-held data-collection de-



```
:A4: [W16]
art Shift  End-Shift  Get_data  Parts_Graph  Uptime_Graph  Initialize  Quit
Begin a new shift.
          A          B    C      D        E         F        G        H
          DATE       DEPARTMENT  SHIFT    START     END      WORK HRS     PART
          14-Mar-90  Widget          1  07:30 AM  03:30 PM       7.5 A16306

                     Move pointer to menu selection and press Enter.

                     TOTALS =>    13.4                112       93       75
 WORK                            HOURS STATION       PARTS    PARTS    PARTS
 STATION             STS  TIME   UPTIME OPERATOR    STARTED FINISHED RELEASED
 ---------------     ---  -----  ------  --------   ------- -------- --------
 Lathe1              Run  14:27     5.5 Ken              19       12        8
 Drill1              Run  14:27     1.2 Ken               5        5        5
 Grinder             Run   9:45     0.5 Sue              15       12       10
 Mill                Run   9:15     1.8 Sue              24       24       22
 Lathe2              Idle  9:15     0.0 Sue               0        0        0
 Hobb                Run   9:45     2.3 Jin              22       17       15
 Drill2              Idle  9:45     0.0 Jin               0        0        0
 CNC                 Run   9:45     2.3 Jin              27       23       15



ACTORY.WK3                          CMD
```

FIGURE 1. The *1-2-3* screen looks like this after the six test-data files specified in this article have been retrieved. When you select Start_Shift, you may change any of the data in row 2. When you select Get_Data and specify a file name, that file's data is read into the table. Each subsequent file's data is added to the previous data. Most of the data in the table is erased from the screen when you select End_Shift, which stores the data to disk. The screen data is instantaneously graphed when you select either of the graph options.

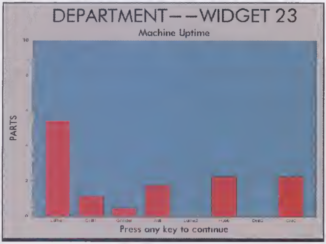


FIGURE 2. These graphs were produced by selecting Parts_Graph and then Uptime_Graph on the macro's main menu after retrieving from the disk the six data files shown in figure 6. The graphs were produced in Release 3 to improve their appearance.

vices have these capabilities. Most also allow you to format data strings having various lengths and various delimiters. For example, you can separate time, date, and production counts by using commas. Or, as is assumed in this article, you can position the data in each record at specific locations within a single string.

To use the model, first make sure that you have initialized it (described later). Then load *1-2-3* and call up the worksheet, which we'll call FACTORY. When the file loads, it starts a macro that displays the menu shown in figure 1. Here is a description of a typical sequence of operations that you might follow:

1. Choose Start_Shift. This puts the cell pointer at the beginning of row 2. Press the RightArrow key to move to any data item for which you wish to change the data, then press the F2 key. A data-entry prompt appears in *1-2-3*'s control panel, and the cursor waits there for your input. Press the LeftArrow key to back up to previous data items, and press Escape when you have finished entering the shift data. The macro's main menu reappears.

2. Choose Get_Data. You are prompted for a file name. Unless the ASCII data files are in the default directory, include the full path name. The macro reads the data from that file into the table, line by line. When it finishes, choose Get_Data again and enter the next file name. This time, the incoming data are automatically added to the previous contents of each cell in the table.

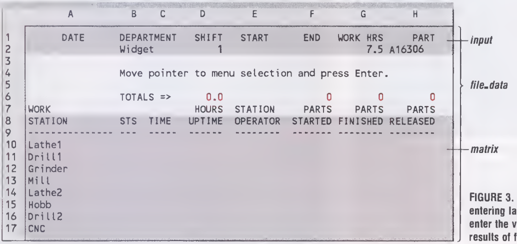
3. Choose End_Shift. The macro stores the tabular data on disk under a file name that includes both the date and the shift number—for example, 3-14-90.SH1. The macro deletes all production data from the screen and redisplays the main menu.

4. Choose Parts_Graph or Uptime_Graph to see a graphical summary of parts production or of the machine's uptime, respectively, based on the consolidated data on the screen. The graphs are like those in figure 2.

5. Choose Quit to end the macro and exit *1-2-3*.

You can use the other menu option, Reset, to reset the production counts to zero if you make an error during data retrieval. Caution: You must select Start_Shift and reenter the *START* time after you select Reset.

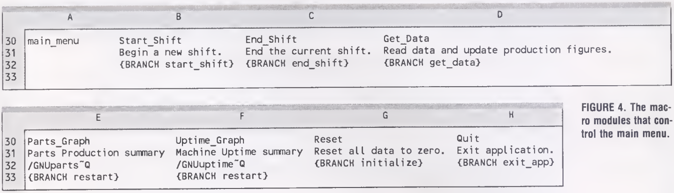
At any time while in *1-2-3*, you may retrieve a shift



```
          A          B     C       D          E          F         G          H

1       DATE      DEPARTMENT  SHIFT   START      END    WORK HRS     PART
2                 Widget         1                              7.5 A16306
3
4                 Move pointer to menu selection and press Enter.
5
6                 TOTALS =>      0.0                   0         0          0
7  WORK                        HOURS  STATION      PARTS     PARTS      PARTS
8  STATION        STS  TIME    UPTIME OPERATOR   STARTED  FINISHED   RELEASED
9  -------------- ---  -----   ------ --------   -------  --------   --------
10 Lathe1
11 Drill1
12 Grinder
13 Mill
14 Lathe2
15 Hobb
16 Drill2
17 CNC
```

FIGURE 3. Use this illustration as a guide in entering labels and starting values. Do not enter the values shown in red, which are the results of formulas.



	A	B	C	D
30	main_menu	Start_Shift	End_Shift	Get_Data
31		Begin a new shift.	End the current shift.	Read data and update production figures.
32		{BRANCH start_shift}	{BRANCH end_shift}	{BRANCH get_data}
33				

	E	F	G	H
30	Parts_Graph	Uptime_Graph	Reset	Quit
31	Parts Production summary	Machine Uptime summary	Reset all data to zero.	Exit application.
32	/GNUparts~Q	/GNUuptime~Q	{BRANCH initialize}	{BRANCH exit_app}
33	{BRANCH restart}	{BRANCH restart}		

FIGURE 4. The macro modules that control the main menu.

record as a worksheet and print it out. You can also set up a worksheet to combine data from many shift records by using the File Combine commands. If you have Release 3, you can do this much more easily than in Release 2/2.01.

BUILD AND TEST THE MODEL

To build this model, follow the instructions in the setup box on pages 74 and 75. The labels and starting values to be entered are shown in figures 3, 4, and 5.

Before you can exercise the model, you must have some data to import. The model, as presented in this article, expects to find the data in files that are organized precisely as shown in figure 6. The figure shows six files. I suggest that you prepare those six files; store them under such names as DATA1.PRN, DATA2.PRN, and so forth; and use them to test the model.

Each row in figure 6 is a record consisting of a single ASCII string. Each datum in the row must start in the column indicated. The starting points are columns 0, 15, 20, 30, 40, 45, and 50. The model does not read the row of repeating digits at the top of each file, but you should enter that row of digits to help ensure accuracy in placing the data. Do not enter the rows of horizontal and vertical lines shown in figure 6.

You can produce such a file by using an ASCII word processor, or by using *Symphony*'s DOC mode and printing to a file. You can also choose to type the data in a single column in a separate *1-2-3* worksheet and print to a file. Be sure to define the Print range to include all the columns covered by the data on the screen.

If you use an ASCII word processor, assign a .PRN extension to the file name. The model has been coded to look for that string and therefore does not require you to enter an extension when you issue the Get_Data command. You can change that extension if you alter the macro code in cell B125 accordingly, or you can permit various extensions by eliminating the extension entirely from that line of macro code. To do that, eliminate the expression *.prn* from the code in cell B125.

You must initialize the model before you can use it for the first time. Initialization consists of entering the date and time values in row 2 under macro control.

To do so, retrieve the worksheet and select Start_Shift. Press the F2 key and enter any date by using the mm/dd/yy format (for example, 3/14/90). Move the cell pointer to cell E2, press the F2 key and enter *7:30*. Similarly, enter *15:30* in cell F2. You must enter military time, though the model will display the time in the usual way. Press Escape to return to the macro's main menu.

The model is ready to receive data. If you select Get Data and then, one at a time, retrieve the six data files you prepared, you should end up with a screen that looks like figure 1. Bear in mind that the display represents only part of a shift. In practice, at the end of a shift you would retrieve a final data record that would be time-stamped.

If you run into a problem in testing the model, you can break out of macro control by pressing Control-Break, then Escape. You can restart the macro by holding down the MACRO key (Alt on most computers) and pressing M.

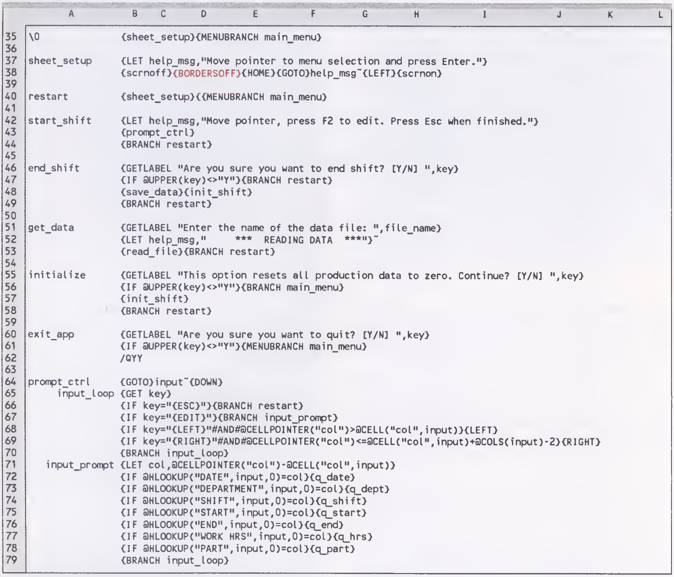
After you have tested the model with the six files provided, you may want to test it more thoroughly. If you produce additional data files, note that it is not necessary to list every machine in every file or even to list them in the same order in every file.

MODIFYING THE MODEL

If you have reasonable facility with macros, a little study of the macro modules in figure 5 will show you how to adapt the model to different data formats. The key is the series of @HLOOKUP and @TRIM statements in range B129..B154.

You may also want to consider some of the enhancements offered by the new releases of *1-2-3*. Releases 2.2 and 3 allow you to suppress the row and column borders. And Release 2.2, for example, allows you, during installation, to specify a 43-line screen if you have an EGA or VGA monitor. The model is not designed to permit up-and-down scrolling, so on a normal screen it is limited to a department that has 11 machines. The 43-line screen would allow you to use this model for as many as 29 machines if

> You can print a shift record or combine data from many shifts.



```
             A                B    C    D     E       F      G      H       I         J      K     L
35  \0              {sheet_setup}{MENUBRANCH main_menu}
36
37  sheet_setup     {LET help_msg,"Move pointer to menu selection and press Enter."}
38                  {scrnoff}{BORDERSOFF}{HOME}{GOTO}help_msg~{LEFT}{scrnon}
39
40  restart         {sheet_setup}{{MENUBRANCH main_menu}
41
42  start_shift     {LET help_msg,"Move pointer, press F2 to edit. Press Esc when finished."}
43                  {prompt_ctrl}
44                  {BRANCH restart}
45
46  end_shift       {GETLABEL "Are you sure you want to end shift? [Y/N] ",key}
47                  {IF @UPPER(key)<>"Y"}{BRANCH restart}
48                  {save_data}{init_shift}
49                  {BRANCH restart}
50
51  get_data        {GETLABEL "Enter the name of the data file: ",file_name}
52                  {LET help_msg,"     ***  READING DATA  ***"}~
53                  {read_file}{BRANCH restart}
54
55  initialize      {GETLABEL "This option resets all production data to zero. Continue? [Y/N] ",key}
56                  {IF @UPPER(key)<>"Y"}{BRANCH main_menu}
57                  {init_shift}
58                  {BRANCH restart}
59
60  exit_app        {GETLABEL "Are you sure you want to quit? [Y/N] ",key}
61                  {IF @UPPER(key)<>"Y"}{MENUBRANCH main_menu}
62                  /QYY
63
64  prompt_ctrl     {GOTO}input~{DOWN}
65       input_loop {GET key}
66                  {IF key="{ESC}"}{BRANCH restart}
67                  {IF key="{EDIT}"}{BRANCH input_prompt}
68                  {IF key="{LEFT}"#AND#@CELLPOINTER("col")>@CELL("col",input)}{LEFT}
69                  {IF key="{RIGHT}"#AND#@CELLPOINTER("col")<=@CELL("col",input)+@COLS(input)-2}{RIGHT}
70                  {BRANCH input_loop}
71     input_prompt {LET col,@CELLPOINTER("col")-@CELL("col",input)}
72                  {IF @HLOOKUP("DATE",input,0)=col}{q_date}
73                  {IF @HLOOKUP("DEPARTMENT",input,0)=col}{q_dept}
74                  {IF @HLOOKUP("SHIFT",input,0)=col}{q_shift}
75                  {IF @HLOOKUP("START",input,0)=col}{q_start}
76                  {IF @HLOOKUP("END",input,0)=col}{q_end}
77                  {IF @HLOOKUP("WORK HRS",input,0)=col}{q_hrs}
78                  {IF @HLOOKUP("PART",input,0)=col}{q_part}
79                  {BRANCH input_loop}
```

FIGURE 5. The macros that drive the model (see also figure 4). The macros continue on the next two pages. Note that the labels in rows 103 and 143 are broken because of their length.

you moved the macro code down accordingly.

With Release 2.2 you could take advantage of file linking. For example, assume that a production-control analyst maintains a worksheet that calculates the number of work hours available to a department, based on the plant's labor standards. If the figure is in a cell named *work_hrs*, which is in a source file called HOURS.WK1, you could put the following file-link formula in cell G2 of the target file:

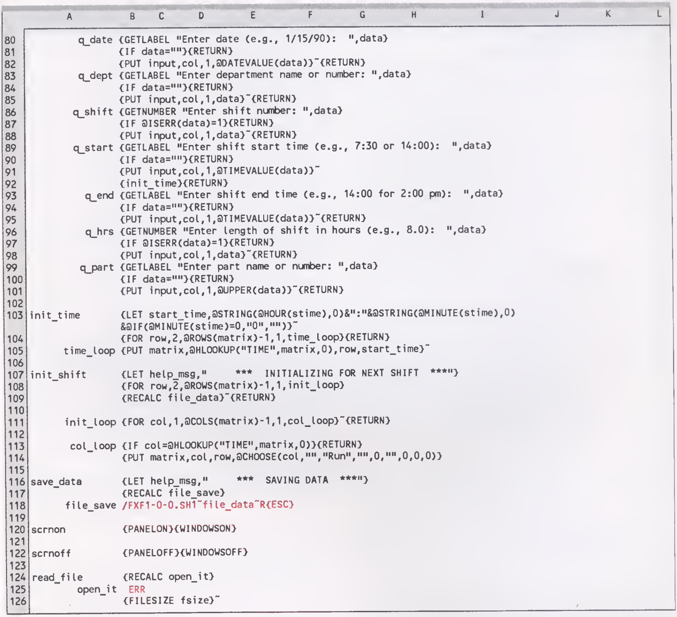
+<<hours.wk1>>work_hrs

For Release 2.2 you could also add a menu option called Print that would invoke *Allways*, assuming you have attached it, and then you could specify a previously designed settings sheet.

Release 3 offers file linking similar to that of Release 2.2. As yet, it has no *Allways*-like capability. However, it does let you show a graph and the related worksheet on the same screen. You would have to add such an option to the menu and write macro code that would both position the cursor at the correct point on the screen and issue a Worksheet Window Graph command.

You might also want to use the multisheet capability of Release 3 to separate the macros from the input screen. Just build the model in sheet A. Then select /Worksheet Insert Sheet After and enter *1*. Hold down the Control key and press PageDown to return to sheet A. Then select /Move, enter A30..H181 as the range to move from, and enter B:A30 as the range to move to. The macros will now reside on sheet B, safely out of the way of any miscalculations related to data input.

If you're skilled in *Symphony*, it would not be hard to



```
         A              B    C    D        E           F          G          H              I              J         K         L
80          q_date {GETLABEL "Enter date (e.g., 1/15/90):  ",data}
81                 {IF data=""}{RETURN}
82                 {PUT input,col,1,@DATEVALUE(data)}~{RETURN}
83          q_dept {GETLABEL "Enter department name or number: ",data}
84                 {IF data=""}{RETURN}
85                 {PUT input,col,1,data}~{RETURN}
86         q_shift {GETNUMBER "Enter shift number: ",data}
87                 {IF @ISERR(data)=1}{RETURN}
88                 {PUT input,col,1,data}~{RETURN}
89         q_start {GETLABEL "Enter shift start time (e.g., 7:30 or 14:00):  ",data}
90                 {IF data=""}{RETURN}
91                 {PUT input,col,1,@TIMEVALUE(data)}~
92                 {init_time}{RETURN}
93           q_end {GETLABEL "Enter shift end time (e.g., 14:00 for 2:00 pm):  ",data}
94                 {IF data=""}{RETURN}
95                 {PUT input,col,1,@TIMEVALUE(data)}~{RETURN}
96           q_hrs {GETNUMBER "Enter length of shift in hours (e.g., 8.0):  ",data}
97                 {IF @ISERR(data)=1}{RETURN}
98                 {PUT input,col,1,data}~{RETURN}
99          q_part {GETLABEL "Enter part name or number: ",data}
100                {IF data=""}{RETURN}
101                {PUT input,col,1,@UPPER(data)}~{RETURN}
102
103 init_time      {LET start_time,@STRING(@HOUR(stime),0)&":"&@STRING(@MINUTE(stime),0)
                   &@IF(@MINUTE(stime)=0,"0",""))~
104                {FOR row,2,@ROWS(matrix)-1,1,time_loop}{RETURN}
105      time_loop {PUT matrix,@HLOOKUP("TIME",matrix,0),row,start_time}~
106
107 init_shift     {LET help_msg,"     ***  INITIALIZING FOR NEXT SHIFT  ***"}
108                {FOR row,2,@ROWS(matrix)-1,1,init_loop}
109                {RECALC file_data}~{RETURN}
110
111      init_loop {FOR col,1,@COLS(matrix)-1,1,col_loop}~{RETURN}
112
113       col_loop {IF col=@HLOOKUP("TIME",matrix,0)}{RETURN}
114                {PUT matrix,col,row,@CHOOSE(col,"","Run","",0,"",0,0,0)}
115
116 save_data      {LET help_msg,"     ***  SAVING DATA  ***"}
117                {RECALC file_save}
118      file_save /FXF1-0-0.SH1~file_data~R{ESC}
119
120 scrnon         {PANELON}{WINDOWSON}
121
122 scrnoff        {PANELOFF}{WINDOWSOFF}
123
124 read_file      {RECALC open_it}
125        open_it  ERR
126                {FILESIZE fsize}~
```

FIGURE 5 continued

change the macros to work in that environment. The previous production-control article listed many of the types of macro commands you would have to alter (December, page 42, column 2).

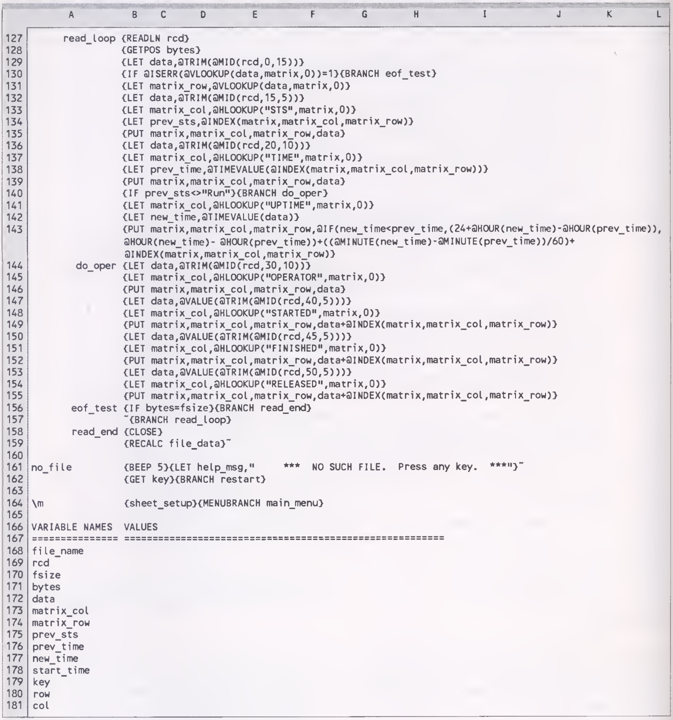
HOW THE MACRO MODULES WORK

As in the earlier model in this series, a key feature of the program is the table of variables, which you'll see in range A168..B181. The macro assigns these variables different values at different times. This simplifies the remaining code, which can use the variables' range names instead of a much longer list of range names.

The economy is especially apparent in the prolific use of the *matrix_row* and *matrix_col* variables in the large *read_loop* section of the code. Without those variables, we would have to put specific row and column numbers throughout the code. As it is, for example, you don't have to know in what row a machine is listed. You can add rows by using the Worksheet Insert Row command without having to change the code.

Another technique worth noting is the use of the @VLOOKUP and @HLOOKUP functions in that same section. To set variable *matrix_col* to the correct value, for example, the macro uses @HLOOKUP to search across the second line of column headings (row 8 on the screen) for the appropriate string of characters, say, *STS*. The technique has two advantages. First, it makes those lines of code self-documenting. Second, it means that you can insert another column in the data matrix without having to edit extensively that section of code.

As in the earlier model, the macro uses some dynamic code—code that changes even as the macro is running.



```
          A            B   C     D        E          F         G        H          I           J       K       L
127      read_loop {READLN rcd}
128                {GETPOS bytes}
129                {LET data,@TRIM(@MID(rcd,0,15))}
130                {IF @ISERR(@VLOOKUP(data,matrix,0))=1}{BRANCH eof_test}
131                {LET matrix_row,@VLOOKUP(data,matrix,0)}
132                {LET data,@TRIM(@MID(rcd,15,5))}
133                {LET matrix_col,@HLOOKUP("STS",matrix,0)}
134                {LET prev_sts,@INDEX(matrix,matrix_col,matrix_row)}
135                {PUT matrix,matrix_col,matrix_row,data}
136                {LET data,@TRIM(@MID(rcd,20,10))}
137                {LET matrix_col,@HLOOKUP("TIME",matrix,0)}
138                {LET prev_time,@TIMEVALUE(@INDEX(matrix,matrix_col,matrix_row))}
139                {PUT matrix,matrix_col,matrix_row,data}
140                {IF prev_sts<>"Run"}{BRANCH do_oper}
141                {LET matrix_col,@HLOOKUP("UPTIME",matrix,0)}
142                {LET new_time,@TIMEVALUE(data)}
143                {PUT matrix,matrix_col,matrix_row,@IF(new_time<prev_time,(24+@HOUR(new_time)-@HOUR(prev_time)),
                   @HOUR(new_time)- @HOUR(prev_time))+((@MINUTE(new_time)-@MINUTE(prev_time))/60)+
                   @INDEX(matrix,matrix_col,matrix_row)}
144        do_oper {LET data,@TRIM(@MID(rcd,30,10))}
145                {LET matrix_col,@HLOOKUP("OPERATOR",matrix,0)}
146                {PUT matrix,matrix_col,matrix_row,data}
147                {LET data,@VALUE(@TRIM(@MID(rcd,40,5)))}
148                {LET matrix_col,@HLOOKUP("STARTED",matrix,0)}
149                {PUT matrix,matrix_col,matrix_row,data+@INDEX(matrix,matrix_col,matrix_row)}
150                {LET data,@VALUE(@TRIM(@MID(rcd,45,5)))}
151                {LET matrix_col,@HLOOKUP("FINISHED",matrix,0)}
152                {PUT matrix,matrix_col,matrix_row,data+@INDEX(matrix,matrix_col,matrix_row)}
153                {LET data,@VALUE(@TRIM(@MID(rcd,50,5)))}
154                {LET matrix_col,@HLOOKUP("RELEASED",matrix,0)}
155                {PUT matrix,matrix_col,matrix_row,data+@INDEX(matrix,matrix_col,matrix_row)}
156       eof_test {IF bytes=fsize}{BRANCH read_end}
157                ~{BRANCH read_loop}
158       read_end {CLOSE}
159                {RECALC file_data}~
160
161 no_file        {BEEP 5}{LET help_msg,"     ***  NO SUCH FILE.  Press any key.  ***"}~
162                {GET key}{BRANCH restart}
163
164 \m             {sheet_setup}{MENUBRANCH main_menu}
165
166 VARIABLE NAMES  VALUES
167 =============== ======================================================
168 file_name
169 rcd
170 fsize
171 bytes
172 data
173 matrix_col
174 matrix_row
175 prev_sts
176 prev_time
177 new_time
178 start_time
179 key
180 row
181 col
```

FIGURE 5 continued

In this model, such code is used in cell B118 to incorporate the current date in the name of the new file to be saved. And the code is used in cell B125 to pick up the name of the data file that's being retrieved.

STARTUP

You can see most of the macro, which is shown in figure 5. Figure 5, which starts on page 70, continues on page 71 and then on to this page.

When you load the template, the macro will start automatically.

Sheet_setup puts the appropriate starting message in the *help_msg* range and sets up the screen for the macro's main menu.

Main_menu sets up a seven-choice menu in the control panel and places the cell pointer on the first entry. The first three options and the last two options, when selected, branch to the routines described in the next

```
01234567890123456789012345678901234567890123456789012345
---------------|----|---------|---------|----|----|----|
Lathe1         Run  7:30      Ken       10   5    3
Drill1         Run  7:30      Ken       5    5    5
Grinder        Down 7:30      Sue
Mill           Run  7:30      Sue       12   12   11
Lathe2         Idle 7:30      Sue
Hobb           Run  7:30      Jim       10   8    8
Drill2         Idle 7:30      Jim
CNC            Run  7:30      Jim       15   12   10

01234567890123456789012345678901234567890123456789012345
---------------|----|---------|---------|----|----|----|
Lathe1         Down 8:38      Ken
Drill1         Down 8:39      Ken

01234567890123456789012345678901234567890123456789012345
---------------|----|---------|---------|----|----|----|
Grinder        Run  9:15      Sue
Mill           Run  9:15      Sue       12   12   11
Lathe2         Idle 9:15      Sue

01234567890123456789012345678901234567890123456789012345
---------------|----|---------|---------|----|----|----|
Grinder        Run  9:45      Sue       15   12   10
Hobb           Run  9:45      Jim       12   9    7
Drill2         Idle 9:45      Jim
CNC            Run  9:45      Jim       12   11   5

01234567890123456789012345678901234567890123456789012345
---------------|----|---------|---------|----|----|----|
Lathe1         Run  10:07     Ken

01234567890123456789012345678901234567890123456789012345
---------------|----|---------|---------|----|----|----|
Lathe1         Run  14:27     Ken       9    7    5
Drill1         Run  14:27     Ken
```

FIGURE 6. The model expects to find data files formatted precisely like these six. Each row is an ASCII string. Each datum in the row must start in the column indicated. The rows of digits and dashed lines are there only to help ensure accuracy in placing the data.

section, Menu Options. The fourth and fifth options use Graph Name Use commands to display named graphs.

MENU OPTIONS

The code for the menu options is shown in figure 4.

Start_shift puts a new help message in the *help_msg* range and calls the *prompt_ctrl* routine to interpret the user's keystrokes during the entry of shift-start data. When that step is complete, the macro branches to *restart*.

End_shift uses the {GETLABEL} command to capture a keystroke in the variable *key*. If *key* is y or Y, the macro calls the *save_data* and *init_shift* routines (see below) and then branches back to *restart*. If *key* is anything else, the macro goes to *restart* immediately.

Get_data uses the {GETLABEL} command to capture the name of a data file in variable *file_name*. It puts a help message in *help_msg*, then calls *read_file*, a major routine described later. Finally, the macro branches to *restart*.

Initialize uses the {GETLABEL} command to capture a keystroke in the variable *key*. If *key* is y or Y, the macro calls the *init_shift* routine and then branches to *restart*. If *key* is anything else, the macro goes to *restart* immediately.

GETTING DATA IN REAL TIME

Several companies are marketing hardware and software that allow production data to be captured in real time and funneled directly into a *1-2-3* spreadsheet. Here are some leads if you want to explore that next step in automating the collection and analysis of real-time factory data.

Burr-Brown Corp. (Tucson, Ariz.) offers the TM9000, a plug-in board for the IBM PC, that can manage a network of up to 64 of its data-collection stations. The hardware has proven to be compatible with macros in *1-2-3* Releases 2, 2.01, 2.2, and 3 and in *Symphony* Releases 1.2 and 2.0. Lotus Development Corp. has also used it successfully in field applications. Pricing is currently under review.

National Instruments Corp. (Austin, Tex.) offers a plug-in board called Lab-PC and a data-collection program called *Measure*, which was once marketed by Lotus. The software stores incoming data directly in a spreadsheet. *Measure* is fully integrated with *1-2-3* and *Symphony*, and it uses settings displays that will look quite familiar to *Symphony* users. The program can handle as many as 16 channels of incoming data in real time. The board is $695; the program, $495.

Square D Co. (Milwaukee, Wis.) offers a plug-in communications board called Sy/Link that can accept input from as many as 200 programmable controllers. It is coupled with a software package called *234Link* that is tightly integrated with *1-2-3*. Fourteen special @functions help read and manipulate incoming data. The board is $1,778; the program, $1,296.

Lotus is ready, or nearly ready, to ship to systems integrators and VARs, or value-added retailers, a program called *Lotus @Factory*, which will help manage factory data. The program is designed to work with *1-2-3* Releases 2.01 and 2.2 and to work on a MAP/OSI (Manufacturing Automation Protocol/Open Systems Interconnection) network. The software is priced at $795. Among initial sources of systems based on *@Factory* are Concord Communications (Marlborough, Mass.), Computrol (Ridgefield, Conn.), and Systems Integration Specialists Co. (Warren, Mich.).

Exit_app uses the {GETLABEL} command to capture a keystroke in the variable *key*. If *key* is y or Y, the macro issues a Quit Yes Yes command (only Releases 2.2 and 3 need the second Yes) to end the program. If *key* is anything else, the macro branches to *main_menu*.

TO END AND START A NEW SHIFT

Save_data puts a new help message in the *help_msg* range. It recalculates the *file_save* macro range in order to ensure that its dynamic code includes the current date, and it executes the dynamic code in the *file_save* subroutine.

File_save extracts the range *file_data*, which contains the production data that has been collected, and saves it to disk. The macro uses string functions to capture the current date and shift number in the file name.

Init_shift puts a new help message in the *help_msg* range. For each row in the data table (*matrix*), it then runs the nested subroutine *init_loop*. For each column, this subroutine calls the subroutine *col_loop*, which inserts 0 in the cell. Thus the data table is initialized to zero values throughout. A {RECALC} command updates the @SUM formulas in the *file_data* range, and control returns to the *initialize* routine and thence to *restart*.

PROMPTING FOR INITIAL DATA

Prompt_ctrl puts the cell pointer on the first data cell in *input* and passes control to the *input_loop* subroutine.

Input_loop waits for a keystroke. It accepts RightArrow and LeftArrow commands as long as they keep the cell pointer within *input*. If Escape is pressed, the subroutine recycles to the macro's main menu. If F2 is pressed, control passes to the *input_prompt* subroutine. Pressing any other key results in no action.

Input_prompt determines what column of the *input* range the cell pointer is on and puts the corresponding number in the variable *col*. It then uses @HLOOKUP functions to determine which item of data corresponds to each column number and calls the appropriate subroutine from the list of *q_* subroutines.

Each of the seven *q_* subroutines uses a {GETLABEL} or {GETNUMBER} command to issue a prompt and wait for the user to enter data. If data is entered, the macro inserts it in the current cell. If the user presses Escape, the old data is left in the cell. In either case, control returns to *input_prompt*. The @ISERR function is required with the {GETNUMBER} command to keep the cell from evaluating to ERR when Escape is pressed. The @TIMEVALUE and @DATEVALUE functions are used for time and date entries, respectively, to convert the labels to values that can be used in calculations.

READING THE FILE

When you select Get_Data from the macro's main menu, you are prompted for the name of the data file that you want to read into the template. *Read_file* recalculates the macro range *open_it* to furnish the file name you specified to an {OPEN} command. It then passes control to *open_it*.

Open_it opens the named file. If the file is not found, the macro branches to the routine *no_file*. If the file is found, the subroutine uses {FILESIZE} to determine its size and assign it to the variable *fsize*. It then passes control to the lengthy subroutine *read_loop*.

Read_loop uses the {READLN} command to read the first line of the data file and store it in the variable *rcd*. It

HOW TO SET UP THE PRODUCTION WORKSHEET AND GRAPHS

1. Releases

This model runs in *1-2-3* Releases 2.01, 2.2, and 3.

2. Individual column widths

Column	Width
A	16
B	5
C	6
D	8
E	10

For example, to set the width of column A, place the cell pointer in column A, select /Worksheet Column Set-Width, and enter *16*.

3. Cell formats

Format	Range
Date 1	A2
Time 2	E2..F2
Fixed 1	G2, D6, D10..D17

For example, to set the format for cell A2, select /Range Format Date 1 and specify cell A2.

4. Cell protection

Select /Range Unprotect (Releases 2.2 and 3: /Range Unprot) and specify range A2..H2.

5. Starting values

Cell	Value
D2	1
G2	7.5

6. Labels

Enter in range A1..H17 all the labels in figure 3. Do not enter the values shown in red, which are the results of formulas. Use the Range Label Center command to center the labels in cells A1, E1, F1, and in range E7..E8. Right-align the labels in ranges D1, G1..H1, D7..D8, and F7..H8. It is essential that there be no spaces ahead of the characters in the labels in range A1..H1, because they are used in @HLOOKUP formulas.

To enter the dashed rules in row 9, type an apostrophe followed by the number of hyphens listed here:

Column	Number
A	15
B	3
C	5
D	6, preceded by one space
E	8, preceded by one space
F	7, preceded by one space
G,H	8

Enter in range A30..H33 all the labels shown in figure 4. The entries in this range will overlap. For display purposes, we've shown figure 4 with a column width of 40. Be sure to precede initial slashes with an apostrophe.

Enter in range A35..B183 all the labels in figure 5 (all three parts) except those shown in red. If you're using Release 2.2 or 3, include the {BORDERSOFF} command shown in red in the *sheet_setup* routine. Precede the labels that are shown indented in column A with a quotation mark (") and no spaces. The indents are intended to clarify the macro's logic. Note that the label in row 143 is broken because of its length. Be sure to enter all parts on one line with no space.

uses the {GETPOS} command to determine the cumulative number of bytes read, and then it stores this in the variable *bytes*. A {LET} command stores the first 15 bytes—the characters in the *WORK STATION* column—of the record in the variable *data*. It then uses @VLOOKUP, coupled with @ISERR, to see if that string corresponds to any entry in the corresponding column of *matrix*. If it does not, the macro branches to *eof_test* to see if the end of the data file has been reached. Otherwise, the macro proceeds to read the next line of the data file.

When the macro locates a match in the *WORK STATION* column, it sets the variable *matrix_row* to the number of that row in the *matrix* range, then puts the next five characters of *rcd* into the variable *data*. It then uses @HLOOKUP to locate the field name *STS*, for status, and sets the variable *matrix_column* to the number of that column in *matrix*. It uses @INDEX to retrieve the value in that cell and to store it in variable *prev_sts*. It uses a {PUT} command to store the new string from *rcd* in that *STS* cell, and it uses another @INDEX command to copy that value into the variable *data_sts*.

The macro uses a similar sequence of commands to retrieve the value in the *TIME* column, to store the previous time value, and to insert the new value in the table. It checks to see if the previous status was *Run*. If not, it branches to subroutine *do_oper*. If so, *read_loop* uses @HLOOKUP to find the *UPTIME* column in *matrix* and sets *matrix_col* to the number of that column. And it uses @TIMEVALUE to extract time value from the variable *data* and to store it in the variable *new_time*. It uses a lengthy @IF formula to subtract *prev_time* from *new_time*, taking into account the possibility that a shift may run past midnight. It uses @INDEX to determine the existing time value in that cell (*matrix_row*, *matrix_col*) of the table, adds the new time interval, inserts the result in that same cell, and passes control to the subroutine *do_oper*.

Do_oper reads and inserts data from *rcd* in the same way *read_loop* does, filling cells in the *OPERATOR, STARTED, FINISHED*, and *RELEASED* columns. The only difference is that there is no need to store copies of new or previous data for these columns in separate variables. After handling the *RELEASED* data, the macro runs the *eof_test* routine. This uses an {IF} command to see whether the value in *bytes*, the pointer's current position in the external file, equals the value in *fsize*, the size of that file. If not, the macro branches to *read_loop* to retrieve the next record from the file. If so, the macro passes control to *read_end*.

Read_end closes the external file and then uses {RECALC} to update the results of the @SUM formulas in the range *file_data*, the data table on the screen.

No_file, a subroutine that is called if the file you name cannot be found, beeps, displays a help message, waits for a keystroke, and branches to *restart*. ■

7. Range names

Name	Range
date	A2
file_data	A1..H17
help_msg	B4
input	A1..H2
matrix	A8..H17
shift	D2
stime	E2

Use the Range Name Create command to assign the range names above. To assign the range name *date*, for example, select /Range Name Create, enter *date*, and indicate cell A2.

To assign the range names in figures 4 and 5, select /Range Name Labels Right, highlight range A30..A164, and press Return. Again select /Range Name Labels Right, highlight range A168..A181, and press Return.

8. Enter and copy formulas

Cell	Formula
A2	@DATE(90,1,15)
E2	@TIME(8,30,0)
F2	@TIME(16,30,0)
D6	@SUM(D10..D17)
F6	@SUM(F10..F17)

Copy cell F6 to range G6..H6.

B118	+"/FXF"&@STRING(@MONTH(date),0)&"-"&@STRING(@DAY(date),0)&"-"&@STRING(@YEAR(date),0)&".SH"&@STRING(shift,0)&"~file_data~R{ESC}"
B125	+"{OPEN """&file_name&".prn""",""M""}{BRANCH no_file}"

9. The Uptime graph

Select /Graph Type Bar and specify the following:

Command	Range
X	A10..A17
A	D10..D17

Select Options and enter titles as follows:

Command	Title string
Titles First	DEPARTMENT—WIDGET 23
Titles Second	Machine Uptime
Titles X-Axis	Press any key to continue
Titles Y-Axis	PRODUCTIVE MACHINE HOURS

Select Scale Y-Scale Manual Upper and enter *10*. Select Quit Quit Name Create, enter *uptime*, and select Quit.

10. The Parts graph

Select /Graph Type Bar and specify the following data ranges:

Command	Range
A	F10..F17
B	G10..G17
C	H10..H17

Select Options Legend A, enter *Started*; select Legend B, enter *Finished*; select Legend C, enter *Released*. Then enter titles as follows:

Command	Title string
Titles Second	Production Summary
Titles Y-Axis	PARTS

Select Scale Y-Scale Automatic, select Quit Quit. Select Name Create, enter *parts*, and select Quit.

11. Save the template

Select /File Save and enter *factory* or another file name that's not currently in your file directory. Be sure to initialize the model as described in the text before you use it.

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ANSWERS TO YOUR QUESTIONS ABOUT LOTUS PRODUCTS

REVISITED

DAY OF WEEK

In the August issue we presented a letter from John McCann, who wanted to know the best formula for displaying the current day of the week in the spreadsheet. We offered one solution and then asked our readers to send in any better solutions. Thanks to all who wrote. Many people suggested the following formula, but Max A. Peckhart of Mattoon, Ill., was the first.

```
@MID("SatSunMonTueWedThuFri",
   @MOD(@INT(@NOW),7)*3,3)
```

Notice that the @NOW function is necessary in this version of the day-of-week formula. This is the simplest solution we received.

BEAT THE GRAPH NAME USE PAUSE IN MACRO

In the August issue (page 75), David Young asked how to make a graph current under macro control so that the macro wouldn't pause and wait for someone to press a key. You listed several solutions, but there is one other that I want to share with other readers.

Rather than create and name all your graphs via the menus, write macro instructions to create each of the graphs. Instead of updating the graph, the macro recreates it. Such a macro moves the cell pointer to the top of each column of data that is a Graph range. Then the macro selects /Graph X (to assign the X range, for example), types a period to anchor the cell pointer, and presses End and DownArrow to highlight the range. The macro also assigns titles, legends, and other graph settings.

Once the macro has assigned a graph's settings, it can save a PIC file of the graph without displaying the graph on your monitor. Macros of this type are less efficient than ones that simply reactivate named graphs, but they eliminate the aggravating pause that suspends macro processing.

Harvey Kogut
San Rafael, Calif

SYMPHONY

STRINGS WITHIN STRINGS

Q. My *Symphony* database contains 88 names and addresses of my friends and business contacts. While I've been able to query the database on just about any criterion, there is one that eludes me. I'd like to be able to find a specific first name no matter where it falls in the *First Name* field.

For example, my database contains three records that have the name *Steve* in the *First Name* field. One record's *First Name* field contains the entry *Steve & Sharon*, a second record's entry is *Steve & Alice*, and a third record contains the entry *Brenda & Steve*.

By using two criteria, I've gotten *Symphony* to locate all three of the *Steve* records at once. The first Criterion record contains the criterion @FIND("Steve", first,0). The second record contains the criterion Steve*. While this works, I question the validity of the approach. Am I going about this correctly?

Thomas P. Clauser
Abraxas International Inc
Casselberry, Fla

A. Your approach is sound, but it's a little more complex than necessary. Consider how your criteria work.

The @FIND function returns a number that represents the location of a string within another string. Your expression @FIND("Steve", first,0) returns ERR when the name *Steve* isn't in a particular record. The formula returns a value of 0 or greater if *Steve* is in a particular record.

When *Steve* is the first word in the *First Name* field, the @FIND function returns 0. To *Symphony* a zero means "not a match," so this criterion can't locate entries that begin with the name *Steve*. When the name *Steve* is any but the first five characters in the *First Name* field, the @FIND function returns a number other than 0. This means "a match." So, of the three *Steve* entries in your database, the @FIND formula can locate only the one that reads *Brenda & Steve*.

The criterion Steve* means "find all entries that begin with *Steve*, no matter what characters follow." This criterion can locate only the records whose *First Name* fields start with the name *Steve*. This criterion matches the records that contain the entries *Steve & Alice* and *Steve & Sharon*.

Together, the two criteria you've written should always find a string within a field entry in a database. However, with a minor change to the @FIND criterion, you can omit the second criterion.

Consider that the formula @FIND ("Steve", first,0) returns ERR when the *First Name* field doesn't contain the name *Steve*. *Symphony* considers ERR to indicate a mismatch. The same formula returns 0 when the *First Name* field begins with *Steve*.

When you add 1 to ERR, the result is still ERR. However, when you add 1 to 0, the result is 1. If your criterion formula returns 1 when the *First Name* field begins with the name *Steve*, you have a match. So modify your @FIND formula to read @FIND("Steve", first,0)+1. This matches any record whose *First Name* field contains the name *Steve*. You'll no longer need to enter a second criterion.

1-2-3

CIRCULAR GLITCH?

Q. As you know, if the nasty mode indicator CIRC appears at the bottom of your screen, you can just about trash your worksheet trying to find the circular reference and correct it. I had a circular reference in a 1,200-row worksheet and deleted all but 14 rows before I finally found the problem.

The source of the problem was an @CELL function that I use to determine the width of a Print range. I was puzzled by the circular reference, so I entered the formula @CELL("width",A1..A1) in cell A1 of an otherwise blank worksheet. The indicator displayed CIRC once again. Is this a known glitch, or am I doing something wrong?

Roger R Moore
San Diego, Calif

A. Any formula that refers to the cell it's in contains a circular reference. Thus, the formula @CELL("width",A1..A1) entered in cell A1 contains a circular reference. However, the formula @CELL("width", A2..A2) entered in cell A1 doesn't contain a circular reference.

In the meantime, stop deleting rows in your search for unwanted circular references. When the CIRC indicator appears, select /Worksheet Status. On the resulting screen, *1-2-3* displays the address of one cell that plays a part in a circular reference. If the CIRC indicator persists after you've corrected the problem, select /Worksheet Status again, and you'll find a second circular reference listed. If you check the Status screen and correct the indicated problems, you'll eventually eliminate the circular references from your worksheet.

WHERE ARE THOSE MAILING LABELS?

Q. Several months ago there was an article in *LOTUS* that explained how to print adhesive mailing labels from information stored in a multicolumn database. I've looked for hours through past issues and can't find the article. Can you tell me when it ran?

Jack L Wrantschar
Houston, Tex

A. Your question gives us an opportunity to make a suggestion to our readers. Granted, *LOTUS* publishes a semiannual index to help you find information in a hurry, but sometimes it's difficult to know where to look in an index.

Quite often you can find a specific article in back issues quickest when you scan the issues' tables of contents. You might keep photocopies of contents pages in a notebook and quickly scan each page when you're looking for an article that you know you saw in the past. Coupled with the regular indexes, a binder of contents pages is indispensable for using *LOTUS* as a reference set.

From scanning the contents pages in one of our binders, we guess you're referring to a 1-2-3 Macros column titled "Mailing Labels in Depth." That article ran in April 1988.

1-2-3/SYMPHONY

WORKSHEET TITLES

Q. I had a problem getting a macro to set titles in my worksheet. My original one-cell macro contained the commands {GOTO}C9~/WTB. [The *Symphony* equiv-

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CIRCLE 111 ON READER SERVICE CARD

alent is {GOTO}C9~{MENU}STBQ.] I wanted it to lock in titles vertically above and horizontally to the left of cell C9.

When I ran the macro, my computer beeped and locked in only one title. After much experimenting, I found that the following macro commands established titles on every run: {HOME}{GOTO}B8~{DOWN}{RIGHT}/WTB. [The *Symphony* equivalent is {HOME}{GOTO}B8~{DOWN}{RIGHT}{MENU}STBQ.]

The second macro moves the cell pointer down and to the right after moving it to cell B8. Why does one macro work but not the other?

Richard L. Burt
Southampton, Mass

A. When you select /Worksheet Titles Both, you lock in everything above and to the left of the cell pointer as titles, assuming there is space between the cell pointer and the frame of the worksheet.

When the cell pointer is against the worksheet's top or left frame, you have not indicated how much of the display *1-2-3* or *Symphony* should reserve for the titles area. The software merely beeps without establishing titles.

Your first macro doesn't guarantee that there will be space above and to the left of the pointer. Sometimes row 9 was the first row of your display. At other times column C was the left-most column of your display.

Your second macro ensures that there is space on the display above and to the left of the cell pointer. It always succeeds because it reserves the available space for the titles area.

CALCULATE A COMMISSION

Q. We often need to calculate commissions using a progressive scale system. We do this calculation by hand, but we'd like to be able to use our spreadsheet. The scale we use is as follows:

Up to $50,000 earns 12%.
Second $50,000 earns 9%.
Anything over $100,000 earns 7%.

How can we calculate commissions?

Bob Carr
Bemis Master Palletizer Systems
Englewood, Colo

A. The formula we came up with to calculate your commissions is rather complex, but you need to enter it only once. Assume that the job whose commission you need to calculate is for $135,000 and that you entered this amount in cell A1. Enter the following formula in cell B1:

```
@IF(A1<50000,A1*0.12,6000)
  +@IF(A1>=50000#AND#A1
  <100000,(A1-50000)*0.09,
  (A1>=100000)*4500)+@MAX
  (A1-100000,0)*0.07
```

The formula calculates and sums three expressions—one for each range of values in your commission schedule. The first expression calculates a commission for the 0 to 50,000 range. The second expression calculates the 50,000 to 100,000 range, returning 0 if the value in cell A1 is less than 50,000. The third expression calculates a commission for any amount beyond 100,000, returning 0 if the value in cell A1 is less than 100,000.

@IF(A1<50000,A1*0.12,6000), the first expression, means, "When the value in cell A1 is less than 50,000, return 12% of that value, but when the value in A1 is 50,000 or greater, return 6,000, which is 12% of 50,000."

The second expression is as follows:

```
@IF(A1>=50000#AND#A1<100000,
  (A1-50000)*0.09,(A1>=100000)
  *4500)
```

This expression is rather complicated and difficult to explain. The conditional statement of the @IF function is A1>=50000#AND#A1<100000. This means, "The value in cell A1 is greater than or equal to 50,000 and less than 100,000."

When that expression is true, the @IF function returns the result of the expression (A1-50000)*0.09.

In other words, it subtracts 50,000 from the value in cell A1 and multiplies the remainder by 0.09. This calculates 9% of the amount that exceeds 50,000 but does not exceed 100,000. The formula uses this expression only when the value in cell A1 is between 50,000 and 100,000.

When cell A1 is less than 50,000 or greater than 100,000, the @IF function returns the value of the statement (A1>=100000)*4500. When the formula is false, it can have one of two values: The expression returns 4,500 when cell A1 is greater than 100,000 and 0 when cell A1 is less than 100,000.

The formula's third expression calculates the sales commission on sales over 100,000. The expression is @MAX(A1-100000,0)*0.07. If the value in cell A1 is greater than 100,000, this expression subtracts 100,000 from the value in cell A1 and multiplies the result by 0.07. If the value in cell A1 is less than 100,000, this expression returns 0.

Summing the results of all the expressions returns the sales commission for any value in cell A1. To calculate a commission on an amount stored in another cell, copy the formula from cell B1 to the cell one column to the right of the value whose commission you wish to know.

CONTROL NUMBER OF PRINTED LINES

Q. I often print a worksheet that is several pages long. I assign a Print range for each page of the printout because it's the only way I know how to control pagination. Is there some other way to control the number of lines on a page?

Deepak Man Shrestha
UNICEF
Kathmandu, Nepal

A. If you arrange your worksheet so that you can print everything from top to bottom in a specific area, you can control how many lines appear on each page by inserting page-break characters. To create a page-break character, move the cell pointer to the left-most column of the selected Print range. Then select /Worksheet Page (in a *Symphony* DOC window, MENU Page).

1-2-3 (or *Symphony*) inserts a row at the location of the cell pointer and places two colons in the new current cell. If the left-most column of the range you want to print contains a page-break character, *1-2-3* prints the information preceding the page-break character, paginates, then prints the information following one row below the character. The page-break character and any text to its right doesn't print. Use as many page-break characters in a single Print range as your job requires. The Worksheet Page command isn't available in Release 1A of *1-2-3*.

INVALID MACRO COMMANDS

Q. I keep getting an error message when I use the following macro command in *1-2-3* Release 2.01:

```
/C@VLOOKUP(temp1,table,1)~~
```

The command is supposed to work with the arrangement shown in the following illustration.

I want the macro to look up a range name in *table* (range B3..C7) based on

	A	B	C
1	temp1	4	
2			
3	table	1	range1
4		2	range2
5		3	range3
6		4	range4
7		5	range5

the value in *temp1*. Then I want the macro to copy from the looked-up range to the location of the cell pointer.

Obviously, *1-2-3* doesn't recognize the @function in the middle of a running macro. What should I do?

Tom Nye
Lake Tahoe, Nev

A. If a menu sequence you write into your macro doesn't work manually, then it won't work when the macro is running. When you select /Copy and then type a formula as the range to copy from, *1-2-3* beeps at you and produces an error message. *1-2-3* must resolve the @VLOOKUP function before it processes the Copy command.

Consider the layout in the following illustration. This is an addition to the worksheet that you provided.

The cell named *rng* contains the formula @VLOOKUP(temp1,table,1). The macro named \c selects /Copy, then calls *rng* as a subroutine. Because the formula in *rng* returns a range name, the macro enters that name as the range to copy from. This also works in *Symphony*.

	A	B	C
9	rng	range4	
10			
11	\c	/C{rng}~~	

INCREASE RATES BY COLUMN

Q. The following worksheet lists various rates that we must increase from time to time. The rate of increase may differ from one column to another, but within a column the increase is constant.

	A	B	C
1	To:	Min	L5c
2	Connecticut	44.31	26.51
3	Delaware	44.64	25.92
4	Illinois	36.93	19.17
5	Indiana	36.93	20.71
6	Iowa	36.93	20.81
7	Kansas	36.93	19.7
8	Massachusetts	44.9	26.52

Suppose, for example, that I need to increase the rates in column B by 10%. Can I do this once for the entire column?

Walt Yarnall
Xpress Truck Lines
Bensalem, Penn

A. We omitted several columns of data from your worksheet, but the principle we'll explain will work just as well in almost any worksheet.

To increase every value in column B by 10%, you must locate a vacant column in which to enter some formulas. You can insert a blank column adjacent to column B. But for this discussion, we'll use column E.

Enter the formula +B2*1.10 in cell E2. This formula calculates the necessary rate increase. Copy the formula down the column as needed—in this example, to range E3..E8. Then select /Range Value (in *Symphony*, MENU Range Values), indicate range E2..E8 as the range to copy from, and indicate cell B2 as the range to copy to. Finally, erase the formulas from column E. If you insert a column in the worksheet, you can erase the formulas by deleting the column.

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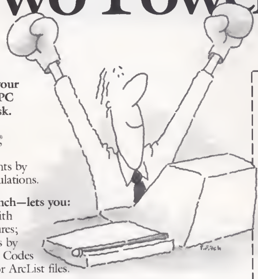
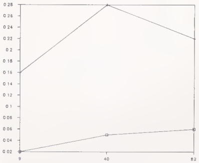


LINE GRAPHS DON'T ALWAYS CUT IT

Q. In *1-2-3* Release 2, I occasionally graph data collected over time. In a graph that I made recently, some data came from a point 9 months into the time series, other data came from 40 months into the time series, and still other data came from 82 months into the time series.

When I graphed these data, each element appeared equidistant from the preceding element.



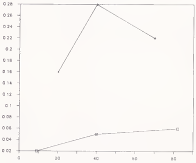
This isn't an accurate representation of the data. It would be useful if I could override this automatic equidistant spacing of data. Please advise.

Thomas J. Mallare
Herbert F. Darling Inc.
Williamsville, N.Y.

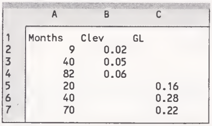
A. You need to use an XY graph. As you have surmised, a line graph simply reveals changes in Y-axis values from one data sampling to the next. There is no X-axis component to a line graph beyond the labeling of the fixed intervals. In an XY graph, the X axis has numeric significance.

An XY graph plots the Y-axis values as functions of X-axis values. This means there can be several values that correspond to the 9 on the X axis.

The graph below is an XY graph with two Y-data ranges. If you try to reproduce it, it may appear slightly different than it does here. That depends on which release of *1-2-3* you use. Our illustration shows how it appears in *1-2-3* Release 2/2.01.



The graph's data appears in the following worksheet.



	A	B	C
1	Months	Clev	GL
2	9	0.02	
3	40	0.05	
4	82	0.06	
5	20		0.16
6	40		0.28
7	70		0.22

The graph's X-data range is range A2..A7. The graph's A range is range B2..B7, and the B range is range C2..C7. Your software determines what values to display on the X axis by evaluating the highest and lowest values in the assigned X-data range.

In *1-2-3* you create an XY graph by selecting /Graph Type XY. In a *Symphony* SHEET window, select MENU Graph 1st-Settings Type XY.

HARDWARE

PRINT WIDE RANGES

Q. I would like to know if it is possible to print more than 240 characters per line on a 24-pin printer? The printers can handle 20 characters per inch, which translates to 270 or 280 characters per line. I've tried to trick *1-2-3* into printing a wide document by setting print borders along with a 240-character Print range, but I've had no luck. Can you help? Is this problem resolved in *1-2-3* Release 3?

Walter K. W. Wong
Honolulu, Hawaii

A. Other than printing half the range, then printing the other half, then pasting the output together, we don't know how to print ranges that exceed the 240-character margin setting in *1-2-3* Releases 2.2 and earlier. Perhaps some of our readers know how to get around this limitation.

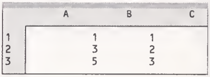
Upgrading to Release 3 would solve your problem because it allows you to set the right margin to 1,000.

CONTEST

NEW CONTEST

This month's contest is a response to a question from Eunice Li Jones of Mechanics Bank in Worcester, Mass. She asked how to get the @VLOOKUP function to return values only when the lookup value exactly matches a value in the lookup column. She wants the function to alert her when the lookup value isn't in the table.

For example, consider the following worksheet:



	A	B	C
1	1	1	
2	3	2	
3	5	3	

The formula @VLOOKUP(1,A1..B3,1) returns 1. The formula @VLOOKUP (2,A1..B3,1) also returns 1. She wants the second formula to indicate that the value 2 isn't in the left-most column of the lookup table.

The first 25 people who submit what the *LOTUS* judges consider the best answer will receive a Lotus Swiss Army knife. Please send us a disk copy and a printed copy of your answer, with appropriate documentation. All entries must be postmarked before midnight, April 30, 1990. Winners will be announced in the July issue. Send your answers to **April Contest**, *LOTUS* Magazine, P.O. Box 9123, Cambridge, MA 02139-9123.

Submit contest ideas to Q&A Contest Idea, *LOTUS* Magazine, P.O. Box 9123, Cambridge, MA 02139-9123. Include your solution, documented with appropriate comments. We'll pay $200 if we use your contest idea accompanied by a proven solution, $25 if we use your idea unaccompanied by a solution.

This material was prepared by Daniel Gasteiger and the Technical Editors.

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Six reasons your business should upgrade to the new Lotus Symphony 2.2

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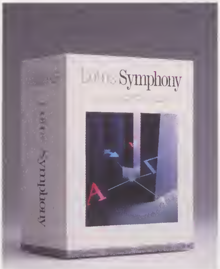

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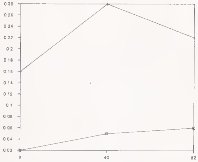

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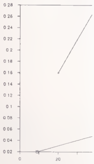

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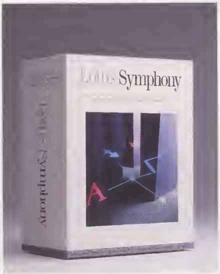

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Lotus Symphony 2.2

System Requirements: Minimum 512K RAM 640K for use with large add-ins. DOS level 2.0 or higher. Symphony runs on IBM XT, AT, PS/2 Models, COMPAQ computers, plus Lotus-certified compatibles. Hard disk required.

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1-2-3

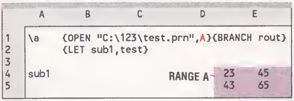
OPEN COMMAND CAVEAT

In *1-2-3* Release 3, the {OPEN} macro command produces the error message *Invalid string argument* if there's a range name in your worksheet that has the same name as one of the {OPEN} modifiers W, R, A, or M. For example, the portion of a macro seen in figure 1 below will cause the error.

To eliminate the error, change the names of the ranges that are causing the error message or enclose the modifier in quotes, as in figure 2 below.

Terry Murphy
Lotus Development Corp.

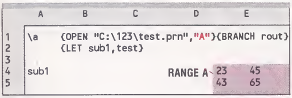
We found that the error doesn't occur when the range in question is a single-cell range that contains a label.



```
        A       B           C              D          E

1   \a      {OPEN "C:\123\test.prn",A}{BRANCH rout}
2           {LET sub1,test}
3
4   sub1                          RANGE A  23        45
5                                          43        65
```

FIGURE 1



```
        A       B           C              D          E

1   \a      {OPEN "C:\123\test.prn","A"}{BRANCH rout}
2           {LET sub1,test}
3
4   sub1                          RANGE A  23        45
5                                          43        65
```

FIGURE 2

ANNOTATING A FORMULA OR A LABEL CELL

I've found a technique that lets me annotate a formula or label cell. To append a comment to a formula cell, add a plus sign to the end of the formula and enter the comment enclosed in quotation marks. The comment evaluates to zero and has no effect on the formula results. For example, enter the following formula to sum the range A1..A20 and divide the amount by 2, with the additional annotation:

> @SUM(A1..A20)/2+"This formula divides the sum in half."

You can use a similar technique to add a hidden comment to a label cell. Begin the cell entry with the @RIGHT or @LEFT function, enter the label as the first argument of the function, and enter a value equal to the length of the text you want to display. Add the comment in the same way you added it in the formula: Add a plus sign and enter the comment enclosed in quotation marks. Then enter a closing parenthesis.

To see how this works, enter the formula below in one cell:

> @RIGHT("Net Income", 10+"Change label if a Net Loss occurs.")

The formula displays *Net Income* in the cell. In both examples you can view the additional comment only by placing the cell pointer in the cell or by putting the cell in Edit mode. The length of the comment in either case is limited to the difference between 240 and the length of the label or formula itself.

To make it easier to see which cells contain hidden comments, remove protection from these cells to highlight or display them in a different color.

Don B. Newcomer
Pittsburgh, Pa.

This technique works in 1-2-3 *Releases 2.01 and 2.2. It does not work in* 1-2-3 *Release 1A or 2, nor in any* Symphony *release. In* 1-2-3 *Release 3, you can annotate a formula by typing a semicolon immediately after the formula and then entering the comment or note.*

RELEASE 3 GRAPHS IN 2.01

You can use the PrintGraph program in *1-2-3* Release 2.01 to print graphs created in *1-2-3* Release 3. Change the default graph extension in Release 3 from CGM to PIC and save the graph by using the Graph Save command. To change the default graph extension, select /Worksheet Global Default Graph PIC Quit Quit.

Eileen Driscoll
Product Support Dept.
Lotus Development Corp.

DELETING RECORDS

The easiest way I've found to remove records from a *1-2-3* database without leaving a blank row is to mark those records and sort them so that they fall into their own grouping in the database. First, select a column to sort, and enter the letter *z* in place of the entry in that column for each record that you want to delete. Next, sort the database in ascending order, with the selected column as the primary sort key. *1-2-3* will group together all the records that you marked with the letter *z*. Now delete all the unwanted records with the Worksheet Delete Row command.

Bernard M. Blass, CPA
Baltimore, Md.

You may find the following technique safer, because deleting rows deletes not only the unwanted records but also anything stored in those rows. First, save *your file in case you mistakenly delete the wrong records. After you've sorted your database, set up a Criterion range with that field and enter z as the Criterion. Select /Data Query Input and specify your database, including the field names, as the Input range. Specify the Criterion range, then select Delete Delete to delete the marked records.*

SYMPHONY

SECURITY FOR YOUR DATABASE ENTRIES

After entering your database records, you may want to prevent someone from making changes to a certain field. You can't use the Range Protect command in a FORM window. But you can use a validity formula in the database Definition range to do the job.

In the following example, the formula +B12<>G12 is in cell F12. Cell B12 refers to the entry in the *Value* column of the Definition range. Cell G12 refers to the entry in the *Input* column of the Definition range. The *Value* column contains the contents of the current record. The *Input* column contains the new entry. If you try to change the entry in the *Code* field, the two fields won't match and the formula in cell F12 will cause *Symphony* to display the error message *Invalid field entry*.

```
      A    B     C    D       E       F        G     H

9   Name Value Type Default Formula Validity Input Prompt
10  Name Devin L:25                                Enter Name
11  Dept Mktg  L:25                                Enter Dept
12  Code    12 N:15                      1         Enter Code
```

If you want to enter additional records into your database through the FORM window, you'll have to remove the validity formula from the Definition range in the SHEET window.

Ed English
Product Support Dept
Lotus Development Corp

DUMMY HELP FILE AVOIDS HELP AND TUTORIAL

I use *Symphony* Release 1.2. When I load the program from a floppy disk, the program always pauses at a screen that states, *To make the following Symphony features available, replace the Program Disk with the Help and Tutorial Disk. Press Return to begin.*

* On-Line Help Facility—(SYMPHONY.HLP)
* Symphony Electronic Tutorial—(TUTORIAL.APP)
* Add-in Applications—(.APP)
* Stored Communications Settings—(.CCF)
* Automatically Loaded Worksheet—(.WR1)

I don't use the options offered by the screen, and pausing to view them doesn't let me run my batch file. I discovered a way to enter *Symphony* directly and bypass this screen. I created a dummy file called SYMPHONY.HLP on the *Symphony* Program Disk. This dummy file tricks *Symphony* into reading a blank file instead of the real SYMPHONY.HLP file. However, when you load *Symphony* this way, the Help facility isn't available during the current session.

To create the dummy file, place the *Symphony* Program Disk without a write-protect tab in the A drive and select SER-

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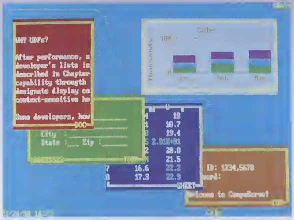

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CIRCLE 113 ON READER SERVICE CARD

VICES File Xtract Formulas. Enter *a:symphony.hlp*, and specify an empty cell from a *Symphony* worksheet.

Create this dummy file on the Program Disk, not on the Help and Tutorial Disk. Otherwise you would destroy the real SYMPHONY.HLP file.

John Jamieson
Colorado Springs, Colo.

This works in all releases of Symphony. *Don't use this technique if your* Symphony *program files reside on your hard disk.*

1-2-3/SYMPHONY

DOCUMENTING MACRO CODE

I've discovered a way to use the {IF} macro command to document my macros.

You can force the {IF} command to evaluate to false by entering 0 as the condition. For example, {IF 0} will always evaluate to false. When *1-2-3* (or *Symphony*) processes an {IF} statement that evaluates to false, it skips all other instructions in the cell containing the {IF} command, then it processes the next cell in the column.

I use this technique to include comments that identify the macro or that describe the function of subroutines or complex macro code. These comments are invaluable when I debug macros or when I look back at a macro that I wrote long ago.

William R Bliss
Westborough, Mass

This technique won't work in 1-2-3 *Release 1A.*

COPYING A TEMPLATE AND SETTING COLUMN WIDTHS

I needed to copy a template to another section of my worksheet. I had solved the frustrating problem of setting the various column widths and didn't want to go through the same work all over again. I used a macro and the Range Value command to solve the problem.

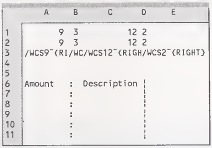
In the example, range A6..D11 contains the template. Enter a single quotation mark and a colon (':) in cell B6 and a single quotation mark and a split vertical bar ('¦) in cell D6. Copy range B6..D6 to B7..B11. Then enter the labels in cells A6 and C6. Set the width of column B to 3, column C to 12, and column D to 2. In cell A1 enter the formula @CELL ("width",!A2). Copy cell A1 to all columns in the template range (in this example, range B1..D1).

Next, select /Range Value (in *Symphony*, MENU Range Values) and specify range A1..D1 as the range to copy from and cell A1 as the range to copy to. Copy the template to the target range.

Enter the following formula in cell A2:

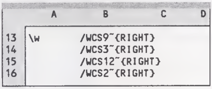
1-2-3: +"/WCS"&@STRING
(A1,0)&"~{RIGHT}"
Symph: +"{MENU}WS"&
@STRING(A1,0)&"~{RIGHT}"

Copy this formula to all remaining columns in the template range (range B2..D2). Use the Range Value (in *Symphony*, Range Values) command to convert the formulas in range A2..D2 to values.



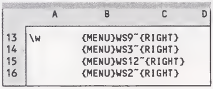
```
        A     B       C       D       E
1           9  3             12 2
2           9  3             12 2
3   /WCS9~{RI/WC/WCS12~{RIGH/WCS2~{RIGHT}
4
5
6   Amount    :   Description ¦
7             :               ¦
8             :               ¦
9             :               ¦
10            :               ¦
11            :               ¦
```

Press slash (in *Symphony*, MENU) and select Range Transpose. Specify range A2..D2 as the range to copy from and a cell in a blank area (in this example, cell B13) as the range to copy to. This transposes the values in row 2 to a column beginning with the cell you specify. The resulting *1-2-3* macro appears in the following figure:



```
          A          B                C       D
13   \w         /WCS9~{RIGHT}
14              /WCS3~{RIGHT}
15              /WCS12~{RIGHT}
16              /WCS2~{RIGHT}
```

The *Symphony* macro is as follows:



```
          A          B                C       D
13   \w         {MENU}WS9~{RIGHT}
14              {MENU}WS3~{RIGHT}
15              {MENU}WS12~{RIGHT}
16              {MENU}WS2~{RIGHT}
```

Enter the label *\w* in cell A13. Use the Range Name Labels Right command to assign the name *\w* to cell B13.

Now, place the cell pointer in the first column of the target template range and start the macro by holding down the MACRO key (Alt on most computers) and pressing W. The macro will set each column's width to match the column widths in the source template.

Dennis Shields
Saratoga, Calif

FUTURE-SUM DEPOSITS

1-2-3 and *Symphony* don't have a built-in function to calculate the deposits needed to reach a future amount. However, you can do this calculation by tinkering with the @PMT function:

Periodic Deposit=–@PMT(fv,i,–t)

In this formula, *fv* equals the future value, *i* equals the interest rate, and *t* equals the number of terms. For example, imagine that you have a 7% fixed interest rate and that you want to know how much to deposit at the end of each year to achieve a $10,000 lump sum at the end of 10 years. The calculation is as follows:

–@PMT(10000,0.07,–10)

This formula evaluates to $723.78. If you want to make monthly payments to arrive at the $10,000 and your interest is compounded monthly, you just adjust the inputs to reflect monthly deposits:

–@PMT(10000,0.07/12,–10*12)

This calculation results in a monthly payment of $57.78.

Kelly Conatser
LOTUS *staff*

HARDWARE

1-2-3 AND IBM PS/2 MOUSE

1-2-3 wouldn't recognize my IBM PS/2 mouse even after I loaded the mouse driver. I called Lotus Product Support and found that you can get this mouse to work—even though it isn't a supported device—if you have *Microsoft Mouse*. Microsoft and other mouse manufacturers provide software that lets you use a mouse with *1-2-3*. *Microsoft Mouse* is a terminate-and-stay-resident program that gives the mouse cursor control. Its menus, which replace the *1-2-3* menus, provide mouse commands and include most of the *1-2-3* commands.

You need to run the mouse-driver setup program from the A drive in order to install the mouse driver and create the

COM files in the *1-2-3* subdirectory (usually \123 or \LOTUS). For setup instructions, refer to the *Microsoft Mouse User's Guide*.

After you run the setup program, enter *mouse* while the *1-2-3* program directory is current. Then enter *ms123-2* to install the mouse menu in *1-2-3*. The *-2* stands for *1-2-3* Release 2 or 2.01. If you have *1-2-3* Release 1A, enter *ms123-1* instead.

Donald Boyle
La Jolla, Calif

REVISITED

HANDLING MAINFRAME DATE NUMBERS

I'd like to add a suggestion to Harry Ralph's idea [July, page 126] and to your comment about converting a mainframe date. Both his solution and your shorter one-cell-formula method use the @MOD function. My idea uses the @STRING and @MID functions to do the date conversion. This approach is more versatile because it can handle either a value, such as 060389, 030689, 890603, or a label form of any of these values and convert it to the format 03-JUN-89.

To see how this formula works, enter *890603* (which represents 6/3/89) in cell A1 and the formula below in cell B1:

```
@DATE(@VALUE(@MID(@STRING
  (A1,0),0,2)),@VALUE(@MID
  (@STRING(A1,0),2,2)),
  @VALUE(@MID(@STRING(A1,0),
  4,2)))
```

Format cell B1 for the Date 1 format. Widen the column to display the date. The formula evaluates values set up in a year-month-day format. To handle values set up in a month-day-year or day-month-year format, use the following formulas, respectively:

```
@DATE(@VALUE(@MID(@STRING
  (A1,0),4,2)),@VALUE(@MID
  (@STRING(A1,0),0,2)),
  @VALUE(@MID(@STRING(A1,
  0),2,2)))

@DATE(@VALUE(@MID(@STRING
  (A1,0),4,2)),@VALUE(@MID
  (@STRING(A1,0),2,2)),
  @VALUE(@MID(@STRING(A1,
  0),0,2)))
```

One caveat: The preceding formulas won't work if your mainframe date is a value that starts with a leading zero—for example, 060389—because the leading zero is truncated when you enter it into a cell.

If you receive the mainframe date as a label, edit the appropriate formula by replacing all occurrences of @STRING (A1,0) with A1. For example, if the label *'890603* is in cell A1, enter the following formula in cell B1:

```
@DATE(@VALUE(@MID(A1,0,2)),
  @VALUE(@MID(A1,2,2)),
  @VALUE(@MID(A1,4,2)))
```

Richard G Sullivan
Department of Health & Human Services
Washington, D.C.

This material was prepared by the Technical Editors, with the help of the Lotus Product Support staff.

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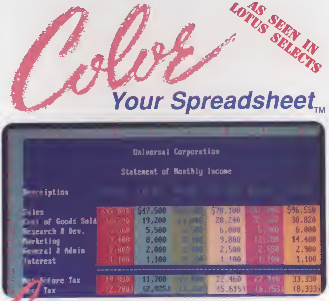

Universal Corporation

Statement of Monthly Income

Description						
Sales	[illegible]	$47,500	[illegible]	$70,100	[illegible]	$96,550
Cost of Goods Sold	[illegible]	19,200	[illegible]	28,240	[illegible]	38,820
Research & Dev.	[illegible]	5,500	[illegible]	6,000	[illegible]	6,000
Marketing	[illegible]	8,000	[illegible]	9,800	12,780	14,400
General & Admin	[illegible]	2,000	[illegible]	2,500	2,650	2,900
Interest	[illegible]	1,100	[illegible]	1,100	[illegible]	1,100
[illegible] Before Tax	[illegible]	11,700	[illegible]	22,460	[illegible]	33,330
[illegible] Tax	(2,700)	(2,925)	[illegible]	(5,615)	(6,753)	(8,333)

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CIRCLE 115 ON READER SERVICE CARD

BEYOND TEXT EDITING

Advanced features of *WordStar* 5.5, *Microsoft Word* 5.0, and *WordPerfect* 5.1

BY MARC DAVIDSON

If you write only short letters or memos, you can get along just fine with any leading word processor. But if your writing needs are more complex and you haven't recently bought a word processor or upgraded to a new version of the one you have, you're probably working harder than you have to. The latest versions of the best-selling word processors let you import and update graphics and spreadsheet data, lay out multiple columns of text, and work with more than one document at once.

In this review, I'll examine three high-end word processors in their most recent incarnations: *WordStar* 5.5, *Microsoft Word* 5.0, and *WordPerfect* 5.1. I'll concentrate on each program's advanced features, since these are the ones you're most likely to be interested in if you're thinking about upgrading your word processor or buying a different one.

IMPORTING SPREADSHEETS

All three programs can import data from a worksheet in Lotus's WKS or WK1 format. *Word* and *WordPerfect* also provide links to let you update imported data with minimum work.

It's simple to import a worksheet into *WordStar*. You position the cursor where you want the data and issue the appropriate command. But if you need to update the data to reflect a change in the worksheet, you have to delete the old data and reimport the worksheet. And if you've added any layout features, such as lines around a table or special spacing between columns, you have to recreate these, too.

Word imports a worksheet just as easily as *WordStar*. But *Word* adds hidden codes to your document to indicate the worksheet's file and range names. With these codes in place, you need only highlight the appropriate paragraph and use a command when you want to update the data. If you don't want to maintain a link for updating the data, you can delete the codes.

If you have more than one section of imported data in the document, you can highlight the entire document and issue a single command to update all the imported data at once. *Word* highlights one imported section at a time and gives you the choice of updating or skipping to the next section.

WORDPERFECT'S LIMITED SPREADSHEET CAPABILITIES ARE IDEAL FOR CREATING BRIEF FINANCIAL REPORTS.

Unlike *WordStar*, *Word* keeps the formatting that's already in the document. So if you've set tabs or created a border, the imported text retains the same tab settings and border when updated. However, you lose horizontal and vertical lines drawn within the table whenever you update the table.

WordPerfect's spreadsheet-import feature is essentially equivalent to *Word*'s, though it's a bit more complicated to use. *WordPerfect* lets you import data with or without a link, and it lets you import it either as tabbed text or as part of a *WordPerfect* table.

If you import the data into a table, *WordPerfect* will automatically create a double-line border around the table and a single-line border around each cell. You retain these borders when you update the table, but if you modify these borders or the column widths, you will lose the modifications when you update.

GRAPHICS

If you ever need to integrate text and graphics—to add a Lotus PIC file to your word-processing document, for example, or add a scanned photo to your desktop-publishing efforts—you'll be interested in the graphics capabilities of these programs.

WordStar provides graphics by way of *InSet*, a stand-alone program. *InSet* can't read any graphics formats but its own. But because *InSet* is memory-resident, you can run it with *1-2-3* and use it to capture a graph from the screen. Similarly, you can capture images from *AutoCAD*, *Dr. Halo*, *Energraphics*, *PC Paint*, *PC Paintbrush*, *Symphony*, *Microsoft Windows*, and most other graphics programs.

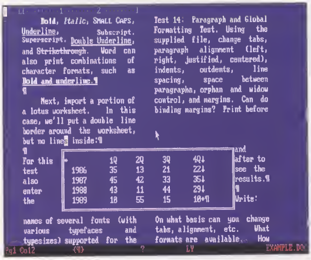
Once you've captured a screen, *InSet* will let you crop, resize, rotate, and edit the image. You can then go to *WordStar*, open a file, and insert a marker to tell *WordStar* where to place the image on the page. When you print, *WordStar* reads the *InSet* PIX file and inserts it, as ordered.

Word and *WordPerfect* both provide their own screen-capture utilities, which work somewhat like *InSet*. However, both can also read many popular graphics formats directly. *Word* can read Lotus PIC, PCX (used in *PC Paintbrush*), HPGL, TIFF (used with many scanners), and Encapsulated PostScript files. *Word* can also read files that have been printed to disk and can import a graphic by way of *Windows Clipboard*.

WordPerfect's list of readable formats is longer than *Word*'s. It includes such additions as GEM Draw and GEM Paint formats and Computer Graphics Metafile format. *WordPerfect* also includes a graphics editor that lets you rotate, scale,

---

Marc Davidson is a free-lance writer and a frequent contributor to LOTUS.



```
 L[·······1·········2·········]
      Bold, Italic, SMALL CAPS,       Test 14: Paragraph and Global
  Underline,          Subscript.      Formatting Test. Using  the
  Superscript. Double Underline,      supplied file, change tabs,
  and Strikethrough.  Word  can       paragraph  alignment  (left,
  also  print  combinations  of       right, justified, centered),
  character  formats,  such  as       indents,   outdents,   line
  Bold and underline.¶                spacing,    space   between
  ¶                                   paragraphs, orphan and widow
      Next, import a portion of       control, and margins.  Can do
  a lotus worksheet.   In  this       binding margins?  Print before
  case, we'll put a double  line
  border around  the  worksheet,
  but no lines inside:¶
  ¶                                                        and
  For this  •         1Q     2Q     3Q     4Q↓            after to
  test         1986   35     13     21     22↓            see  the
  also         1987   45     42     33     35↓            results.¶
  enter        1988   43     11     44     29↓            ¶
  the          1989   10     55     15     10•¶           Write:

  names of several  fonts  (with      On what basis can  you  change
  various     typefaces      and      tabs, alignment,  etc.   What
  typesizes) supported  for  the      formats are  available.   How
Pg1 Co12        {¶}           ?          LY                 EXAMPLE.DOC
```

FIGURE 1. ***Word*'s display is the closest to WYSIWYG (what you see is what you get) of any text-based word processor. Note the two-column text and boldface, italics, underlining, double underlining, and small capitals. The table, created by importing a portion of a spreadsheet, has a double-line border.**

and size a graph. *Word* does not.

Both *Word* and *WordPerfect* let you specify the size of your graphic and let you position it anywhere on a page—even across columns on multicolumn documents. Both programs automatically wrap text around a graphic that intrudes into a column. *WordStar* can't do this, but you can get the same effect yourself if you're willing to work at it.

COMMAND STRATEGIES

Naturally, each program has it's own keyboard-command structure. You can issue most of *Word*'s commands in three ways: via menus, function keys, and mnemonic shortcut keys (such as the Alt-C key combination for Center paragraph). The program also supports a mouse, which you can use for highlighting text, selecting choices from a menu, or changing windows and window sizes. The result is that very few of *Word*'s commands can be issued in only one way.

Most of *WordStar*'s original commands are based on mnemonic Ctrl-key combinations. For example, as an alternative to your computer's Arrow keys, *WordStar* uses the Control key in combination with four letter keys that occupy the same positions, relative to each other, as the Arrow keys do on the number keypad: Control-E for up, Control-X for down, Control-S for left, and Control-D for right. This allows a touch typist to navigate the screen and the menus without having to move from the "home" typing keys.

If you don't appreciate the mnemonics, you will appreciate *WordStar* 5.5's new pull-down menus. However, in addition to listing each command by name, the menus also list the corresponding shortcut keys to help you learn them more easily. That's fortunate, because many of the shortcut keys for the new commands are hardly mnemonic. For example, the command for opening a window is the key combination Control-OK. *WordStar* also makes 40 commands available by way of function keys.

WordPerfect traditionally has included only function-key commands. Version 5.1 has added pull-down menus that let you bypass the function keys, but you still need to use some function keys to make some choices in these pull-down menus.

WordPerfect's pull-down menus work much like the menus in *Word*. You can issue commands either from the keyboard or by using a mouse. And like *Word*, *WordPerfect* lets you select a block of text using the mouse. However, the mouse is not as responsive in *WordPerfect* as in *Word*, and it's not as fully integrated. For example, you can use the mouse to call up the help index, but you can't pick the help topic by pointing to it with the mouse.

WINDOWS

Word's windowing feature is far more sophisticated and useful than the windowing features in *WordPerfect* and *WordStar*. *Word* lets you open as many as eight windows at once. This is useful when you write a long document. You can store each section in a different file but still have the ability to switch among sections easily. These windows can occupy a full screen, or they can be split horizontally or vertically. You can also switch between full-screen and split views by using a single keystroke.

Most important: If you open more than one window on a given file, any changes you make in one window will automatically appear in the other window or windows. That means you can make changes to more than one window, then save the file to disk without worrying about overwriting one version of the file with another.

Both *WordPerfect*'s and *WordStar*'s window features are far more limited than *Word*'s, but are quite similar to each other's. Both programs allow a maximum of two windows. These can be full-screen windows, or you can split the screen horizontally to show both windows at once. Both programs also let you set the size for the windows. Like *Word*, *WordPerfect* lets you display the windows in different colors. *WordStar*, however, does not.

WordStar and *WordPerfect* let you open the same file in two windows, which lets you see one part of the file while working on another. But the changes you make in one window are not automatically made in the other. That means you must be careful to make all your changes in the same window and always save the file while in that window. If you save the file in the second window under the same name as the file in the first window, the file in the second window overwrites the file in the first window.

MACROS

Macros are important in word processors because they let you automate tasks and customize the program to suit your working style. For example, *Word*'s windowing feature can require a lot of keystrokes. If you use two or three window formats regularly, it makes sense to write a macro to set up each format. From then on, you can open your favorite window formats with one or two keystrokes.

The macro features in both *Word* and *WordPerfect* are among the best in any word processor. Both programs will let you create a macro by recording your keystrokes as you perform a task. Both programs also let you go back and edit the macro to add commands that are similar to the macro commands in *1-2-3*.

However, *WordPerfect* requires a special, and somewhat clumsy, macro editor that works slightly differently than *WordPerfect* itself. *Word*, on the other hand, lets you bring a macro into the editing screen and edit it just as you would any other text.

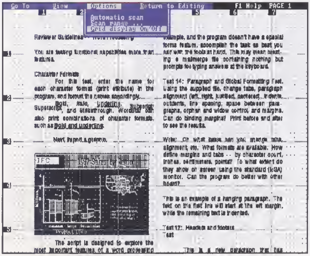


FIGURE 2. *WordStar*'s print-preview feature is one of the best available in any word processor. Shown here is a page set in the Helvetica font, as viewed with the zoom feature. You can use the background grid to help align text and graphics.

Both *Word* and *WordPerfect* let you create an unlimited number of macros that you can invoke by name. In addition, *WordPerfect* lets you create a total of 26 macros that you can invoke by holding down the Alt key and pressing any letter key. *Word* uses the Control key and allows two-key combinations. This lets you create a large number of mnemonic macros—Control-PP for Print Page, Control-PD for Print Document, and so on. If you're an ex-*WordStar* user, you can reproduce the original *WordStar* command set by using *Word* macros. *Word* also lets you create macros that duplicate the function keys, which, in effect, lets you redefine all the function-key commands. In fact, you can also define the function keys to serve much the same purpose as the *WordPerfect* function keys.

WordStar's macro feature comes in a distant third. The program has no Learn mode. The only way to create a macro is to go to the macro editor and type it in. Nor is there a macro language. This is a severe limitation, since you can't even create macros that pause during playback to let you enter information or confirm settings. And *WordStar*'s choices for macro names are limited to the Escape key plus one character.

OUTLINING

A collapsible outline lets you create a document that has one or more levels of section headings and then collapse the document to hide text and lower levels of headings. You can then look at the document's structure and reorganize it by moving the headings around. Any text or lower-level headings automatically move with the heading under which they are collapsed.

This capability is obviously valuable if you write highly structured documents, such as technical papers or agendas for monthly meetings. Less obvious is that the feature can also be helpful for writing that is not as structured. For example, suppose you're writing a book. Even if your outline headings are simply the chapter numbers, collapsing the document to those headings allows you to move quickly from chapter 1, say, to chapter 25.

Word's outliner is far ahead of the others, primarily because it is fully integrated into the program. You can use one keystroke to switch between a partially collapsed outline and a standard editing screen. You can edit text while working in the outline, and even look at a collapsed outline in one window and edit the text in another.

WordStar's outliner is actually a bundled version of *PC-Outline*, which can run as a stand-alone or memory-resident program. *PC-Outline* is a fully functional collapsible outliner, but it's completely separate from *WordStar* itself. You can move files between *WordStar* and *PC-Outline*, but the procedure is somewhat clumsy, because you first have to save the file to disk in one program and then read it into the other program. And because *PC-Outline* uses a different set of editing commands than *WordStar*, you have to learn a completely new program.

WordPerfect's outliner is fully integrated, but it isn't collapsible. *WordPerfect* 5.1 has a new ability to move, copy, or delete a given heading and everything under it, but it doesn't let you collapse the outline to let you quickly see the structure of a large document. It's useful for creating lists and such, but it's not much help for anything longer than a page or two.

NEWSPAPER-STYLE COLUMNS

WordStar lets you have as many as eight newspaper-style columns per page. The program gives you no option to display the columns on-screen as you edit, but it does display a marker that indicates which column you are currently editing. Except for the narrower width of the column, there is no difference between editing single-column text or multicolumn text.

Word's and *WordPerfect*'s features for working with columns are similar to each other and more extensive than *WordStar*'s. *Word* allows as many as 22 newspaper columns; *WordPerfect* as many as 24. Both programs give you the option of showing the columns side by side on-screen, and both keep track of what belongs on each page, snaking text from column to column and from page to page, as appropriate. Both programs include a simple command to let you jump among columns. However, each program (especially *Word*) slows down noticeably when you display columns side by side.

PARALLEL COLUMNS AND TABLES

Parallel columns and tables are similar. Both consist of adjacent columns, each of which contains text items that must remain aligned with specific text items in an adjacent column. For example, a script makes use of parallel columns: Each speaker's name in one column must be aligned with that speaker's words in the adjacent column. Both parallel columns and tables work best if you can edit one column independently of its neighbors. In *WordStar* you must create parallel columns by using tabs. You can take the same approach in *Word* and *WordPerfect*, but both of those programs also offer a more advanced parallel-columns feature.

To create parallel columns in *Word*, you define appropriate left and right indentions for adjacent text items or paragraphs and then specify which text items in one column should be aligned with specific text items in the adjacent column. As with newspaper-style columns, you can choose to see the columns side by side on-screen or not. If you choose to show the layout on-screen, the program slows down noticeably when scrolling.

You can edit any column independently, and you can add, delete, or move columns. However, if you add or subtract lines within one column, you have to manually adjust the lines in the other columns to match.

When using parallel columns to build a table, you can put borders around the table, add vertical lines between columns, and add horizontal lines between rows. And you can use decimal tabs or right-aligned tabs within the columns.

In comparison, *WordPerfect*'s parallel-column feature offers more-limited capabilities, but these limitations are addressed in the new Table feature. With this feature, you can easily split or join rows, columns, or individual cells. By default, all cells are framed with a single-line border, but you can easily change the border or eliminate it on individual cells or groups of cells. The Table feature also lets you define cells of different widths and heights, making it a good tool for designing complicated forms.

A *WordPerfect* table can also function as a spreadsheet. As you might expect, the spreadsheet features are limited and a bit clumsy to use, but you can put a formula in a cell, change a value in another cell, and have *WordPerfect* calculate the answer. This baby spreadsheet is ideal for creating a brief monthly report.

WYSIWYG

None of these programs' editing screens offer the true WYSIWYG (what you see is what you get) that you'll find in a *Microsoft Windows*–based or Macintosh word processor. However, they all make some attempt at matching what's on the screen with what shows up on the printed page.

Word comes closest to having true WYSIWYG. Most of its layout features are accurately reflected on-screen. That includes margins, multiple columns, line breaks, and centering. If you have a graphics card and monitor, you can also see print attributes, such as boldface, underline, italics, and small capitals. However, text is not displayed with proportional spacing, no matter what font you use.

WordPerfect and *WordStar* run a close second. Both reflect most layout features accurately on-screen, but not most print attributes. Both display boldface as brighter text, and other attributes in colors. If you're using an EGA card with *WordPerfect*, you can accurately display one additional print attribute—italics, underline, or small capitals. However, in my tests with an IBM EGA card, this option caused the screen to flicker. According to the manual, most print attributes can be displayed if you use a Hercules RamFont card. If you have a RamFont, consider *Word* and *WordPerfect* to be roughly equal on this score.

AN OUTLINER CAN BE HELPFUL EVEN FOR SHORTER, LESS STRUCTURED DOCUMENTS.

PAGE PREVIEW

Since none of these three programs offer true WYSIWYG, a print-preview feature can serve a valuable function on complex layouts. By essentially printing your document to your graphics monitor, page preview lets you see columns, graphics, and font sizes the way they'll appear in print. And because using page preview is much faster than printing the document, this feature can save considerable time when you experiment with a complex format.

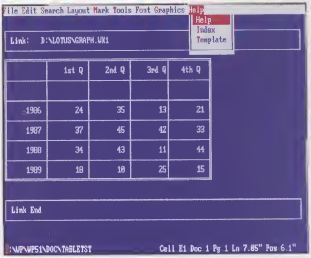
Word's page preview is the most limited of the three. *Word* lets you jump to any page, move through the file page by page, and view either one or two pages at a time. However, the program makes no attempt to generate different fonts or even legible text, and it doesn't let you zoom in to check details. For your most complex formatting, you have to print pages to see what the output looks like.

WordPerfect lacks the command to jump to a specific page. But it offers all the other features in *Word*'s page preview, plus the ability to zoom in on the text. *WordPerfect* lets you see a full page or zoom in 100% or 200%. Text is easily readable at either zoom setting, and the fonts displayed are similar to the fonts designated in the document.

WordStar's page preview offers all the features you'll find in *Word* and *WordPerfect*, and more. You can jump to any place in the document, using commands to go to the first, last, next, previous, or specified page. You can view one full page, zoom in at two levels to see details, or zoom out to see two or six pages on the same screen. Depending on your monitor, you can also see from 10 to 144 miniature pages on the screen at once. When you zoom in on a page, you can quickly and easily focus on any part of that page. One particularly nice touch is the ability to turn on a background grid. Combined with the zoom feature, this can be helpful for small adjustments of text or graphics alignment.

YOUR CHOICE

Each of these programs is more than adequate for most of your word-processing needs. And each has some advantages



Link: D:\LOTUS\GRAPH.WK1

	1st Q	2nd Q	3rd Q	4th Q
1986	24	35	13	21
1987	37	45	42	33
1988	34	43	11	44
1989	18	10	25	15

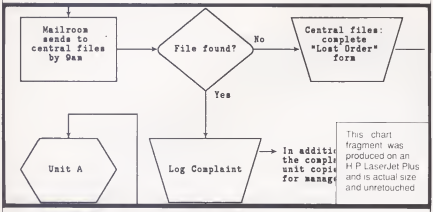
Link End

```
:\WP\WP51\DOC\TABLETST                    Cell E1 Doc 1 Pg 1 Ln 7.65" Pos 6.1"
```

FIGURE 3. *WordPerfect*'s tables don't look any different from tables in other programs, but the lines and borders are generated automatically. The code in the box above the table indicates an imported graph. *WordPerfect*'s new pull-down menus are at the top of the screen.

EasyFlow

An on-screen chart processor that knows about charts and diagrams, not just another "screen-draw" program that makes you do most of the work. **EasyFlow** is a powerful full-screen graphics program dedicated to data-flow diagrams, flow charts and organization charts. With it you can quickly compose diagrams. More important, you can easily modify them so they are always up to date.


Mailroom sends to central files by 9am
File found?
No
Central files: complete "Lost Order" form
Yes
Unit A
Log Complaint
In additi
the compl
unit copi
for manag

This chart fragment was produced on an H P LaserJet Plus and is actual size and unretouched

Automatic. Fully automatic text centering within shapes. Fully automatic line routing & rerouting. Fully automatic placement of text along lines.

Fast. Written in assembly language for speed.

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over the others. Yet most interesting of all is that the differences between the three programs keep narrowing with each revision.

For example, *WordStar* offers what is arguably the best mail-merge feature of any word-processing program. Of particular interest to *1-2-3* users is that *WordStar*'s mail-merge feature can take data directly from a *1-2-3* worksheet. *Word*'s mail-merge feature is, however, a close copy of *WordStar*'s. And *WordPerfect* 5.1 has drastically improved its mail-merge feature.

You can't go too far wrong with any of these programs. However, when choosing among these programs, know which features are important to the way you work. If you don't like function keys, *WordPerfect* 5.1 is the wrong program to get—even though it doesn't rely on function keys as much as earlier versions. If parallel columns are important, then *WordStar* is the wrong choice. If page preview can help you, *Word* 5.0 cannot. Ultimately the decision depends on personal taste. ■

IN BRIEF

Microsoft Word 5.0. Microsoft Corp., 1 Microsoft Way, Redmond, WA 98073; 206-882-8080. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers. Requires DOS 2.0 or higher or OS/2 1.0, 384K of RAM, two double-sided floppy disks, or one double-sided floppy disk and a hard disk. Released 5/89. $450; upgrade from any previous version, $75; upgrade free if previous version purchased after 10/1/89. 30-day, money-back guarantee.

WordPerfect 5.1. WordPerfect Corp., 1555 North Technology Way, Orem, Utah 84057; 801-225-5000. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers. Requires DOS 2.0 or higher and 384K of RAM (512K recommended). A hard disk is recommended; a graphics adapter and monitor are required for the graphics- and print-preview features. Released 11/89. $495. 90-day warranty against defective disks.

WordStar 5.5. WordStar International, 33 San Pablo Ave., San Rafael, CA 94903; 800-227-5609. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers. Requires DOS 2.0 or higher, 384K of RAM (512K required to use page preview, outliner, or graphics). A hard disk recommended; a graphics adapter and monitor are required for the graphics- and page-preview features. Released 5/89. $495. 90-day warranty against defective disks.

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CREATE FORMS AND MANAGE DATA WITH ONE PROGRAM

FormBase 1.0 packs its own relational-database manager and directly accepts data from *1-2-3* worksheets.

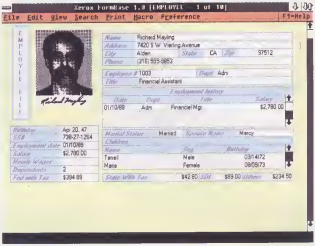
BY JON PEPPER

In the December issue we looked at two WYSIWYG (what-you-see-is-what-you-get) forms processors: *PerForm Designer & Filler* Version 2.0 and *JetForm Design* Release 2.0. We saw that each program's WYSIWYG interface makes it easy to recreate your existing, preprinted forms on screen, to design new forms, and to customize forms with logos, signatures, and other graphics. We saw that each program lets you fill in forms with data stored in another program. And we saw that each program can help you reduce the time and money you devote to producing and filling in forms.

Xerox FormBase ($495), another WYSIWYG forms processor, was not available in time for the December review. But our subsequent test revealed that *FormBase* is a cut above those other programs. Unlike any other forms processor on the market, this *Microsoft Windows*-based program includes its own integrated, relational-database manager. That saves lots of work if you need to fill in several different forms with the same or related data. And unlike *JetForm* and *PerForm*, *FormBase* lets you fill in your forms with data stored in *1-2-3* Release 2/2.01 or 2.2 or *Microsoft Excel* worksheets without first converting those worksheets to ASCII files.

RELATIONAL FORMS

You create a *FormBase* form in much the same way that you create a data-entry form with a database program. First, you position your cursor and type a field name. Next, you define the field type (i.e., numeric, label, calculated), color (for display on the screen or for printing on a color printer), font, borders, fill-in area, and so on. Finally, you use your mouse to define the field size and position.


Xerox FormBase 1.0 [EMPLOYEE 1 of 10]
File Edit View Search Print Macro Preference F1=Help
EMPLOYEE FILE

Name Richeid Mayling
Address 7420 S W Vierling Avenue
City Alden State CA Zip 97512
Phone (316) 555-9853
Employee # 1003 Dept Adm
Title Financial Assistant

Employment history

Date	Dept	Title	Salary
01/10/89	Adm	Financiel Mgr	$2,780 00

Birthday Apr 20, 47
SS# 738-27-1264
Employment date 01/10/89
Salary $2,780 00
Hourly Wages
Dependents 2
Fed with Tax $394 89

Marital Status Married Spouse Name Marcy

Children

Name	Sex	Birthday
Terell	Male	03/14/72
Marie	Female	08/09/73

State With Tax $42 80 SDI $89 00 Others $234 50

Although *FormBase* has no drawing tools, you can use it to create sophisticated forms with scanned images and varied colors, shading, line thicknesses, and fonts.

As you create your form on the screen, *FormBase* automatically creates a corresponding database with the same fields. Each time you fill in the form, the program automatically stores the information as a record in the database.

Because it integrates forms processing and data management in one program, *FormBase* offers conveniences that neither *JetForm* nor *PerForm* offers. For instance, you don't have to switch back to your database program every time you need to query, sort, or search your data. And if you need to fill in a single form, you can type the information once, into the form, without reentering the data into your database.

FormBase's database is relational. That means you can create a new form that includes some of the fields from an existing form, as well as some new fields, without creating an entirely new database.

To see how much work *FormBase* can save you, suppose you run a mail-order catalogue business. You use *FormBase* to create a form called Mailing List, which is nothing more than an on-screen representation of a reply form you included in a print advertisement. As you receive each reply form in the mail, you enter the name and address from the form into the Mailing List form and mail out a catalogue.

Next you use *FormBase* to create a second form, called Purchase Order, which you use to record individual orders and then pass on to your warehouse for fulfillment. The Purchase Order form includes several new fields—*Payment method*, *Credit-card number*, *Part number*, and *Price*—but it must also include the same *Name* and *Address* fields contained in the Mailing List form.

The Purchase Order form and the Mailing List form are linked via the shared *Name* field. Thus, each time you enter a name into the Purchase Order form, the program automatically pulls the corresponding address data from the Mailing List form into the Purchase Order form.

In contrast, if you create the Purchase Order form in *JetForm* or *PerForm*, you can't use it to record orders. Instead, you have to record your orders in your database or spreadsheet program and then

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Jon Pepper wrote about forms-processing software in the June and December issues of LOTUS.

import that information back into your forms processor to fill in the Purchase Order forms. If you record these orders in a spreadsheet or a nonrelational-database program, you have to reenter a customer's name and address every time that customer places an order.

SPECIAL FEATURES

Like many database programs, *FormBase* lets you customize your forms to prevent data-entry errors. You can attach help messages to any field on your form. Using the included Bitstream *Fontware* program, you can distinguish field names and entered data by type size, style, or color. And you can lock any field so that a user can't enter new data or edit existing data in that field. This is an excellent safeguard when some of the data that appears in one form is actually entered into a different form, by a different user.

Calculated fields are easy to set up. You can enter your formulas in English. For example, to calculate a field called *Finance charge*, you can enter *Amount due* × (*Days overdue* × *Rate*).

FormBase includes several sample databases and 50 sample forms covering a wide variety of business needs. You can probably get started in *FormBase* by using one of these forms as is or by modifying it slightly to suit your needs. The program also includes a library of graphic images, which can be modified.

Unlike *JetForm* and *PerForm*, *FormBase* doesn't include drawing tools, so you can't create a graphic, such as a logo, as you design your form. But *FormBase* does give you comparable control over line thickness, gray shading, and form size (see feature chart). You can import or scan graphics from other programs into a form. You can also scan a preprinted form into the program, but it comes in as a graphic image only. The scanned form can serve as a layout guide, but you have to reenter each field name to create a corresponding database.

DATA TRANSFER

FormBase lets you import data directly from *1-2-3* Release 2/2.01 and 2.2, *Excel*, and *dBase* files and export data directly to these files. The import and export features worked smoothly in my tests. When working with *1-2-3* data, however, you can't import or export formulas, and you can't import or export text fields longer than 256 bytes.

For most form-filling applications, *FormBase*'s database capabilities are more than adequate. But if you need to analyze the data in your forms, you may want to export that data to *1-2-3* or to a dedicated database program. These programs contain sophisticated mathematical functions not found in *FormBase*. You can define more sort keys in a dedicated database program than you can in *FormBase*. And you can sort, query, or search a large database much faster in a non-*Windows* database program than in *FormBase*.

Otherwise, *FormBase*'s sole drawback may be the equipment it requires. At minimum, you need an 80286- or 80386-based computer, 640K of RAM, a mouse, a hard disk with 2 megabytes of free space, and a printer and graphics adapter compatible with *Windows*. For the best performance, the publisher recommends an additional megabyte of RAM if you run *FormBase* on an 80286-based computer and an additional 2 megabytes of RAM if you run it on an 80386-based computer. If you want to store Bitstream *Fontware*, the sample forms, and the graphics library on your hard disk, you need 7 megabytes of free disk space. ■

Feature Chart: FormBase vs. PerForm and JetForm

	FormBase	*PerForm Designer & Filler*	*JetForm Design*
Edit graphics	Yes	No	Yes[a]
Bar codes	Yes	Yes	Yes
Vary form size	Yes	Yes	Yes
Vary line thickness	Yes	Yes	Yes
Vary gray scale	Yes	Yes	Yes
Grids/rulers	Yes	Yes	Yes
Mix typefaces	Yes	Yes	Yes
Mix point sizes	Yes	Yes	Yes
Fonts	Bitstream- & *Microsoft Windows*-compatible printer fonts	Bitstream- & PostScript-compatible printer fonts	Bitstream, Type Director, and printer fonts
Accept scanned forms	Yes[b]	Yes	Yes
Integrated database	Yes	No	No
Calculate fields	Yes	Yes	Yes
Validate fields	Yes	Yes	Yes
Graphic import/export	All *Windows*-compatible graphics files	*GEM* Line Art; import only: TIFF, *GEM* Image, PCX, MSP	TIFF, MSP, PCX, PIC
File import/export	ASCII, *dBase III* & *IV*, WK1	ASCII, *dBase III Plus*	ASCII, *dBase III* & *IV*, Unix (w/*JFMerge*)
On-line help	Yes	Yes	Yes
Tutorial	Yes	Yes	Yes
Templates	Yes (50)	Yes (29)	Yes (8)
Undo	Yes	Yes	Yes
Interface	*Windows*	*GEM/3*	*Windows*
Support mouse	Yes	Yes	Yes
Printer	Any *Windows*-compatible printer	Any *GEM*-compatible printer	Laser printers only
Price	$495	$294.95	$495

[a] Will edit only graphics designed by *JetForm*

[b] Accepts scanned forms as graphic images only, does not automatically create corresponding database

IN BRIEF

Xerox FormBase Version 1.0. Xerox Desktop Software, 9745 Businesspark, San Diego, CA 92131; 800-822-8221 Runs on the IBM PC AT, PS/2 Models 50 or higher, and compatible computers. Requires DOS 3.1 or higher, 640K of RAM, a hard disk with 2 megabytes of free space, and a graphics card and printer compatible with *Microsoft Windows*. Includes run-time version of *Windows*. A mouse is recommended. Released 10/89. $495. Sixty days of free customer service (not a toll-free call); discounted corporate support plans available. Limited 90-day warranty.

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San Mateo, CA 94403
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3 Fair	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4 Poor	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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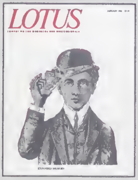

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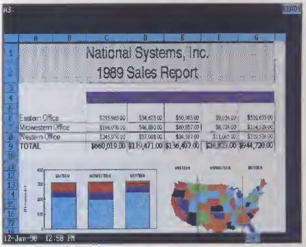
Impress Version 2: More Spreadsheet-Publishing Power for *1-2-3*



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READY

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1			National Systems, Inc.				
2			1989 Sales Report				
7	Eastern Office		$215,965.00	$34,673.00	$50,983.00	$9,034.00	$310,655.00
8	Midwestern Office		$198,078.00	$46,890.00	$60,837.00	$8,724.00	$314,529.00
8	Western Office		$245,976.00	$37,908.00	$24,587.00	$11,065.00	$319,536.00
9	TOTAL		$660,019.00	$119,471.00	$136,407.00	[illegible]	$944,720.00

12-Jan-90 12:58 PM

***Impress* version 2 dresses up your worksheet with more fonts, colors, and graphic file formats than *Allways* does. Your printout can include *1-2-3* graphs, *Lotus Freelance Plus* graphs, or any graph stored in the computer graphics metafile (CGM) format.**

Like *Allways*, *Impress* version 1 brought the output quality of desktop publishing to *1-2-3* Releases 2/2.01 and 2.2. Like *Allways*, *Impress* 1 displayed your worksheet in WYSIWYG (what-you-see-is-what-you-get) graphical mode, where you could enhance it with attractive fonts, borders, shading, and embedded *1-2-3* graphs. And *Impress* 1 went a step further than *Allways* by letting you edit your data without switching back to *1-2-3*. But it printed more slowly on a dot-matrix printer than *Allways* did, and the output was often not as sharp.

Shortly after *Allways* and *Impress* 1 were released, Lotus Development Corp. offered a free copy of *Allways* with each copy of *1-2-3* Release 2.01 sold in America, and a free copy of *Impress* 1 with each copy of *1-2-3* Release 2.01 sold in Europe. Later, Lotus purchased the rights to *Allways* and incorporated it into *1-2-3* Release 2.2.

Enter *Impress* version 2 ($149.95). This just-released upgrade prints output equal to that of *Allways*, but it goes beyond *Allways* or *Impress* 1 by adding a more robust desktop-publishing interface to *1-2-3*. *Impress* 2 lets you use a mouse to navigate *1-2-3*'s menus and worksheet. In addition to letting you import *1-2-3* graphs, it lets you import any graph stored in computer graphic metafile (CGM) format, including graphs created with *Lotus Freelance Plus*. You can flip graphs, rotate them, and enhance them with borders, labels, titles, and arrows.

Unlike *Allways*, *Impress* 2 can print wide worksheets sideways. And like *See-More* ($99.95, Personics Corp., Maynard, Mass.), *Impress* lets you display more rows and columns on your screen than *1-2-3* does by itself.

More control of text

Impress 2 gives you more ways to format your words and numbers than *Allways* does. The program includes four software fonts, which you can scale to any size between 3 and 72 points. In contrast, *Allways* comes with three software fonts that range between 5 and 24 points. Unlike *Allways*, *Impress* uses Bitstream fonts. If you have other Bitstream fonts that you use with other programs, you should be able to use them with *Impress* 2, as well.

This add-in also brings a bit of word processing to *1-2-3* by automatically wrapping and justifying text within a specified range. And you can assign attributes, such as boldface and italic, to individual characters.

All this functionality delivers an obvious advantage over *Allways*: You can create more-polished printouts without having to switch out of the WYSIWYG interface every time you have to edit your data.

However, when you press the PageUp or PageDown key or when you hold down an Arrow key to move the cursor repetitively, *Impress* 2 responds more slowly than *1-2-3* alone. Macros that repeatedly update the screen will probably run more slowly when *Impress* is active.

And although *Impress* 2 prints better-looking dot-matrix output than its predecessor, it may not print it any faster. I tested a beta version of *Impress* 2 against *Allways*, using an 80286-based computer running at 10 MHz and a Panasonic 1092 dot-matrix printer. *Impress* 2 took 6 minutes and 35 seconds to print 26 lines of formatted text and numbers. *Allways* printed the same worksheet in only 1 minute and 25 seconds.

Your options

If you already own *1-2-3* Release 2.2, you probably want to consider *Impress* 2 only if you need its extra features. Your decision is more complex if you still own *1-2-3* Release 2.01, because the cost of upgrading to Release 2.2 ($150) is essentially the same as the cost of buying *Im-*

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press 2. If you can't do both, you have to weigh your need for the best available spreadsheet-publishing capabilities against your need for the other enhancements in Release 2.2—and, if you have a dot-matrix printer, against the faster output of *Allways*.

Neither *Impress* 2 nor *Allways* works with *1-2-3* Release 3. However, Lotus has publicly announced its intention to add spreadsheet-publishing capability to Release 3. —*Bill Lawrence*

Impress Version 2. PC Publishing, 1801 Avenue of the Stars, Suite 815, Los Angeles, CA 90067; 800-634-4555, in Calif. 213-556-3630. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers. Requires *1-2-3* Release 2/2.01 or 2.2, 92K of RAM beyond that required for *1-2-3* and the Add-In Manager, a hard disk, and a CGA, EGA, VGA, or Hercules graphics adapter. (Note that when run with a CGA adapter, *Impress* displays in black and white only.) Released 2/90: $149.95; upgrade from *Impress* Version 1, $49.95. 30-day, unconditional guarantee.

CIRCLE 1 ON READER SERVICE CARD

UTILITIES

Shareware Library of dBase Programmer Utilities

dBUtility Library is a collection of more than 1,000 public domain and shareware utilities that run with *dBase* and *dBase*-compilers. It is designed for programmers and developers. Some of the 70 categories of products include debuggers, documenters, clones, graphics routines, and assembly language. You also get a directory of the shareware programs and 700 additional commercial products. The complete library comes on 50 disks compressed with *PKzip*. It comes with a search program that lets you search by free-text, by name of a utility or a vendor, or by type of utility. The library is updated quarterly.

Runs on the IBM PC, PS/2, and compatible computers with DOS 2.1 or higher and uses 300K of RAM for the search program. $99.50, including the directory and search program; $15 for the directory on disk; $25 for the directory in printed form. To registered owners, $75 for the most recent version of the complete library; $25 for the new entries only. From EMS Professional Shareware Libraries, 4505 Buckhurst Ct., Olney, MD 20832; 301-924-3594.

CIRCLE 2 ON READER SERVICE CARD

File and Disk Management

XTreePro Gold is a memory-resident file- and disk-management program that lets you control up to 13,000 files on 26 fixed or floppy disks. It provides a graphic display of any disk's directory tree. The program lets you automate virtually all operating system procedures. You can modify the DOS date and time stamps of a file; view, delete, move, and rename any combination of files; and move and delete entire subdirectories.

LINDA SCHARF

You can gather data in blocks and then print it or place it in another file. You can store the start-up parameters for up to 13 applications and start them with a single keystroke or click of the mouse without going to DOS. The manufacturer provides registered owners of *XTree Gold* with a free copy of *Archive Manager*, a utility that lets you compress and encrypt files into libraries compatible with the industry-standard ARC format.

Runs on the IBM PC, PS/2, and compatible computers with DOS 3.1 or higher. Uses 256K of RAM when active or 7K of RAM when inactive. $129; $40 to upgrade from other XTree products. From XTree Co., 4330 Santa Fe Rd., San Luis Obispo, CA 93401; 805-541-0604.

CIRCLE 3 ON READER SERVICE CARD

Easy-to-Use DOS Shell Automates Applications

DOS Partner integrates the management of applications, files, and drives. Geared to the casual user, it automatically searches your hard disk for an application and then loads it. Your applications appear on primary and secondary menus. Each primary menu holds the full names of 24 applications. From a file-management menu, you can copy, move, rename, or delete files and directories. The program lets you name, format, and copy floppy disks. You can determine the status of any item or group of items in a directory or on your disk drives.

Runs on the IBM PC, PS/2, and compatible computers and uses 200K of RAM when active and 7K of RAM when running in the background. $99, from Easy-Soft, 1215 Hightower Trail, Suite B100, Atlanta, GA 30350; 800-526-6201.

CIRCLE 4 ON READER SERVICE CARD

Import Text from any File

Fetchit is a pop-up program that lets you browse through external files while you're working in a program and transfer selected text from the files to the program. When you search for data in a subdirectory, *Fetchit* gives you a list of files if more than one file contains data that matches your search expression. Programmers can switch the display format to show text in both HEX and ASCII formats. A memory-display mode shows you any address in memory.

Runs on the IBM PC, PS/2, and compatible computers with DOS 3.0 or higher. Uses 35K of RAM. $79.95, from Business Resource Software, 2013 Wells Branch Pkwy., #305, Austin, TX 78728; 800-423-1228.

CIRCLE 5 ON READER SERVICE CARD

OTHER SOFTWARE

Create 2-D, 3-D, Contour, and Smith Plots from External Data

Axum, designed for scientists, engineers, and statisticians, provides several types of plots. They include line, scatter, bar, histogram, regression, 3-D regression, logarithmic, polar, mesh, irregular contours, and Smith-reflection plots. You can combine, overlay, or insert multiple plots. You can also rotate or reshape 3-D objects. A graph editor lets you enter comments using 21 fonts that include Russian characters and lets you add arrows, symbols, and axis specifications. You can import data from *1-2-3*, *Symphony*, *dBase*, or ASCII files. You can export graphs in PIC, *GEM*, PostScript, Hewlett-Packard Graphics Language, and Tektronix file formats.

The program lets you enter, edit, and manipulate numerical data. You can perform a variety of statistical analyses, fit curves, and smooth data sets of unlimited size. A built-in programming language provides more than 100 functions and operators. The program is menu driven and has context-sensitive help screens.

Runs on the IBM PC, PS/2, and compatible computers with a hard disk. Uses 450K of RAM. Math coprocessor recommended. $495; discounts for universities and for government agencies. From Tri-

Metrix, 444 Northeast Ravenna Blvd., Suite 210, Seattle, WA 98115; 206-527-1801.

CIRCLE 6 ON READER SERVICE CARD

Business Agreements on Disk

AgreeMentor is a collection of 16 sales and marketing agreements that you can customize. Included are basic contracts in the areas of nondisclosure, dealer resale, consulting, independent sales, partnership, and computer leasing. Each agreement is in a form similar to a business letter and avoids legal jargon.

Runs on the IBM PC, PS/2, and compatible computers and uses 512K of RAM. $99, from Jian Tools for Sales, 127 Second St., Los Altos, CA 94022; 800-442-7373.

CIRCLE 7 ON READER SERVICE CARD

Translate English to Spanish

Translate lets you translate English text into Spanish text. You can either import an ASCII file and then translate it, or you can translate text while you enter it. You can see nine lines of English text and of the corresponding Spanish text on the screen. Based on a dictionary of more than 80,000 words, the program translates complete sentences and correctly selects gender and number suffixes. You can add as many entries as you like—the size of the dictionary is limited only by disk space. You can also suspend a translation at any point, save it, then later return to the point where you left off. The program is best suited to simple, straightforward English.

Runs on the IBM PC, PS/2, and compatible computers (8 MHz or higher is recommended) with DOS 3.0 or higher and a hard disk. Uses 512K of RAM. $399 until June 1990; $495 thereafter. From Finalsoft Corp., 3900 Northwest 79th Ave., Suite 215, Miami, FL 33166; 305-477-2703.

CIRCLE 8 ON READER SERVICE CARD

Customize or Use Predesigned Models for Decision Analysis

Criterium is a decision-making system that lets you structure a problem, reorganize it, analyze it, and then document and present the results of your evaluation. The program lets you integrate objective, quantifiable data with subjective, qualitative data.

Seven ready-to-use decision-making models accompany the program to help make such decisions as how to finance a business, choose a computer system, or plan a litigation strategy. You can export the results of your analysis to a worksheet file, where you could transform the analysis into a financial projection.

Runs on an IBM PC XT, PC AT, PS/2, or compatible computer with one or two floppy-disk drives, a hard disk, and 512K of RAM. $495, from Sygenex, 15446 Bel-Red Rd., Suite 450, Redmond, WA 98052; 800-869-7150, in Wash. 206-881-5500.

CIRCLE 9 ON READER SERVICE CARD

HARDWARE

PostScript Printer Delivers 16.7 Million Colors

Colormate PS is a color PostScript printer that uses thermal-transfer technology. It lets you print at a resolution of 300 dots per inch and uses a four-color ribbon that can produce 16.7 million colors. The printer simulates the full Pantone color palette and provides 35 resident fonts. It comes with 8 megabytes of RAM and has an Adobe PostScript interpreter. An optional, external 20-megabyte hard-disk drive ($995) gives you access to extra fonts, overlays, business forms, and other elements used in document design.

Runs with IBM PC, Apple Macintosh, and compatible computers. $9,995, from NEC Technologies, 1414 Massachusetts Ave., Boxborough, MA 01719; 508-264-8000.

CIRCLE 10 ON READER SERVICE CARD

Mouse and Graphics Tablet

Wiz is an input device that combines the functions of both a mouse and a graphics tablet. The mouse provides a cross-hair window and three buttons that you can click to yield six command options. You can add macros to four of the six controls. The 9.5-by-11.8-inch graphics tablet gives you precise cursor positioning for drawing with a resolution of 1,000 dots per inch. Command templates and supporting software are available ($49 each) for 17 DOS and *Windows* applications, including *1-2-3*, *Lotus Freelance Plus*, *Symphony*, *dBase IV*, *Microsoft Word*, *WordPerfect*, *Aldus PageMaker*, and *Microsoft Excel*.

Runs with IBM PC, PS/2, and compatible computers and uses 30K of RAM under DOS. $249, from CalComp, 2411 West La Palma Ave., Anaheim, CA 92801; 800-458-5888.

CIRCLE 11 ON READER SERVICE CARD

CPU Board with '386 Processor and SCSI Controller

The Multibus I CPU is a type of board used in telecommunications, industrial automation, aerospace, and defense systems. It combines a 20-MHz 80386 processor with a SCSI (Small Computer Systems Interface) peripheral controller. The combination saves one slot in your computer for another add-in card. The CPU board comes with two serial ports, a parallel port, two iSBX connectors, an advanced DMA controller, and an iLBX bus interface. You can populate the board with 1, 2, 4, or 8 megabytes of RAM (expandable to 16 megabytes), as well as an Intel '387 math coprocessor ($550). SCSI data transfers are buffered on the board for sustained high-speed performance.

$4,900 for a board with 1 megabyte of RAM; $250 for each additional megabyte of RAM. From Intel Corp., 3065 Bowers Ave., P.O. Box 58065, Santa Clara, CA 95052; 800-548-4725.

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Fax- and Data-Modem Board

Purefax offers you fax-modem transmissions at 9,600 bits per second (bps) and Hayes-compatible data-modem transmissions at 2,400 bps over one telephone line. The board has a call-discrimination feature that determines what kind of device originated an incoming call and then routes the call to the appropriate modem. Included with the board is a runtime version of *Microsoft Windows* and *Fax Manager*, a *Windows*-based application for sending, receiving, and viewing fax messages. Purefax comes in standalone and local area network (LAN) versions. The LAN version includes the *Fax Supervisor* utility, which adds network security features to the system but does not include *Windows*. The board is compatible with DCA/Intel Communicating Applications Specification software, such as *1-2-3*, *WordPerfect*, *Q&A Write*, *cc:Mail*, and *LanFax/10*.

Runs with the IBM PC, PS/2 Model 30,

and compatible computers. $895 for the stand-alone version; $1,550 for the LAN version. From Puredata Ltd., 180 West Beaver Creek Rd., Richmond Hill, Ont., Canada L4B 1B4; 416-731-6444.
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Requires 22K of RAM. $139 for serial version; $149 for bus version. From Logitech, 6505 Kaiser Dr., Fremont, CA 94555; 415-795-8500.
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More Macros for Applications Without Requiring More RAM

MacroMaster/pro is a 12-key add-on keyboard that records and stores up to 96 macros. The keyboard uses none of your computer's RAM and needs no separate power source. The maximum number of keystrokes per macro is 900 on an IBM PC XT and 600 for a PC AT or PS/2. All macros combined may use no more than 3,600 keystrokes on a PC XT or 2,400 on a PC AT or a PS/2. However, a second MacroMaster/pro can be added.

Supplied keyboard overlays let you record your macro selections for each application with which you use the keyboard. The Spacebar lets you delay the macro to prevent your computer's keyboard buffer from overflowing.

Runs with an IBM PC XT, PC AT, PS/2, or compatible computer. $249 for 24 macros; $385 for 96 macros. From New England Computer Products, 160 North Main St., Randolph, MA 02368; 800-634-6692, in Mass. 617-963-9313.
CIRCLE 15 ON READER SERVICE CARD

TRAINING

Teaches Beginners and Advanced Users Releases 2.01 and 2.2

FastStart Plus for Lotus 1-2-3 is a training program that comes in versions for either Release 2.01 or 2.2. The program is broken up into two workshops: Basic Skills and Advanced Skills. Both train you interactively by simulating *1-2-3*. You take the workshop lessons in any order. A small manual comes with the program.

Runs on the IBM PC, PS/2, and compatible computers and uses 256K of RAM. $150 for each workshop; $250 for both. From ComTrain, 103 Providence Mine Rd., Suite 202, Nevada City, CA 95959; 916-265-0300.
CIRCLE 16 ON READER SERVICE CARD

Learn Symphony and 1-2-3 Release 3

Logical Operations offers four courses for Lotus *1-2-3* Release 3: *Spreadsheets*, *Database & Graphics*, *Macros*, and *Advanced*. Each is designed as a one-day instructor-led course. Each course includes an instructor kit, overhead transparencies, 12 student manuals, and 12 data disks.

Symphony Skills, made up of spreadsheets and database-management sections, has a smaller, less-detailed instructor's guide, and the student manuals don't have indexes or expanded-concept sections.

Each *1-2-3* starter package (for 12 students) is $900, with volume discounts available; $800 per course for government or educational institutions; $26 for each additional student manual and disk; $23 per student manual for government or educational institutions. $288 for the *Symphony* course; $24 for each additional student manual and disk. From Logical Operations, 595 Blossom Rd., Rochester, NY 14610; 800-456-4677.
CIRCLE 17 ON READER SERVICE CARD

UPGRADES

The Computer Library's Computer Periodicals Database is a CD-ROM disk containing a year's worth of computer-related articles that are updated monthly. It includes the full text of 19 leading computer publications and abstracts of articles from more than 110 computer, business, and technical publications. The database now has the full text of 11 leading computer-industry newsletters, including *Andrew Seybold's Outlook on Professional Computing*, *P.C. Letter*, *Release 1.0*, *Softletter*, *Tech Street Journal*, *Microprocessor Report*, and *Patricia Seybold's Office Computing Report*.

Runs on the IBM PC XT, PS/2, and compatible computers with a CD-ROM drive that uses Microsoft MS-DOS CD-ROM extensions, a hard disk, and DOS 3.1 or higher. Uses 512K of RAM. $765 for a year's subscription (plus $25 for shipping and handling), from Ziff Communications, One Park Ave., New York, NY 10016; 212-503-4400.
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LINDA SCHARF

AlphaWorks 2.0 is an integrated program made up of word processing, database, spreadsheet, graphics, and communications modules. The database now includes relational features. Using lookup routines, it lets you in one operation pull data from multiple databases and place data in another database. You can fill in templates to build search-and-index expressions. A new file viewer lets you see a directory list and view the first 20 lines of a file without retrieving it. You can create your own menus, with items that call up a submenu or execute a macro. Other new features include mouse support, new database field rules, expanded terminal emulation, and error-correction protocols.

Runs on the IBM PC, PS/2, and compatible computers with DOS 2.1 or higher and uses 512K of RAM. $195, from Alpha Software Corp., One North Ave., Burlington, MA 01803; 617-229-2924.
CIRCLE 19 ON READER SERVICE CARD

QuikMap Version 2.0, a geographic information system, lets you overlay data from *1-2-3*, *dBase*, *Excel*, or ASCII files onto base maps. You can now calculate the area, length, and perimeters of lines and polygons. You can display a compass bearing, as well as the distance between two points. You can set multiple maps into an existing map display. Other new features in the program let you create custom legend boxes, use any of the 113 line styles and 44 hatch patterns, view or edit *dBase* and *Excel* files, produce high-resolution output with laser printers and other raster devices, and export to *Auto-*

CAD DXF files and desktop-publishing packages.

Runs on the IBM PC, PS/2, and compatible computers with a hard disk. Uses 512K of RAM. Math coprocessor recommended. $700 before May 1, 1990; $800 thereafter; free upgrade from version 1. From ESL Environmental Sciences Ltd., 2045 Mills Rd., Sidney, B.C., Canada V8L 3S1; 604-656-1922.

CIRCLE 20 ON READER SERVICE CARD

Graftool Version 2.1 is a scientific graphics program that lets you create 2-D and 3-D graphs. The graphing functions are interactive, allowing you to analyze and manipulate data while working on a graph, instead of having to go back and forth to your data source. You can rotate or scale a graph, legend, or text in three dimensions, with no limitation on the angles or degrees. You can plot up to 268 million data points, whereas the previous version could handle only 65,000. You can include Greek and math symbols in a graph, produce multicolored curves and surfaces, and make 3-D–to–2-D projections. It lets you import many file formats, including Lotus DIF files and ASCII files. The new version also supports PostScript-compatible printers and allows variable line-width and character formatting.

Runs on the IBM PC, PS/2, and compatible computers with a hard disk and DOS 3.0 or higher. Uses 400K of RAM. Math coprocessor recommended. $495; free upgrade from earlier versions. From 3-D Visions, 412 South Pacific Coast Hwy., Suite 201, Redondo Beach, CA 90277; 800-729-4723

CIRCLE 21 ON READER SERVICE CARD

BOOKS

Expert Advisor: 1-2-3 Release 3 by Mark M. Williams and Nelda M. Rinckenberger. Alphabetized reference for all Release 3 commands and functions; also includes a detachable, quick-reference book. Published April 1990, 624 pages, $22.95 paperback. From Addison-Wesley Publishing Co., Reading, MA 01867; 617-944-3700.

CIRCLE 22 ON READER SERVICE CARD

Inside Allways: The Spreadsheet Publisher by Corey Sandler and Tom Badgett. Covers how to publish spreadsheets in *1-2-3* Releases 2.01, 2.2, and 3. Published June, 297 pages, $22.95 paperback. From John Wiley & Sons, 605 Third Ave., New York, NY 10158-0012; 212-850-6000.

CIRCLE 23 ON READER SERVICE CARD

Illustrated Lotus 1-2-3 Release 2.2 by John Mueller. For first-time and experienced users, includes complete macro reference. Published April, 320 pages, $21.95 paperback. From Wordware Publishing, 1506 Capital Ave., Plano, TX 75074; 800-229-4949.

CIRCLE 24 ON READER SERVICE CARD

Desktop Publisher's Dictionary by Larry S. Bonura. Over 4,000 terms, words, and abbreviations explained on topics from typography to binding and finishing. Published March 1989, 456 pages, $21.95 hardback. From Wordware Publishing, 1506 Capital Ave., Plano, TX 75074; 800-229-4949.

CIRCLE 25 ON READER SERVICE CARD

Learning PostScript: A Visual Approach by Ross Smith. Primer on the popular page-description language for the nontechnical reader. Published March, 425 pages, $22.95 paperback. From Peachpit Press, 1085 Keith Ave., Berkeley, CA, 94708; 800-283-9444.

CIRCLE 26 ON READER SERVICE CARD

How to Copyright Software, 3rd Edition by attorney M. J. Salone. Covers what a copyright is, how long it lasts, and how it protects your work. Also covers transfers, licenses, derivative work, and upgrades. Published October 1989, 256 pages, $34.95 paperback. From Nolo Press, 950 Parker St., Berkeley, CA 94710; 800-992-6656, in Calif. (except area code 415) 800-445-6656, in area code 415, dial 549-1976.

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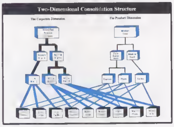

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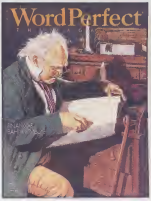

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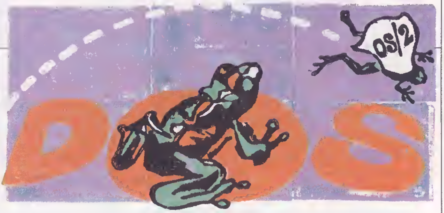

JOHN HART

BY LINDSY VAN GELDER

Microsoft Corp. Chairman Bill Gates recently acknowledged that despite earlier projections, OS/2 "won't fully eclipse DOS for another three or four years." It was a refreshing dose of reality.

In fact, although sales of the much-hyped operating system are growing, DOS sales currently outnumber OS/2 sales 10 to 1. OS/2 has suffered from the tardy release of drivers for printers and other devices, from its failure to work properly on some clones, and from many users' refusal to invest in a system that at present requires vastly more-expensive hardware to run a vastly smaller pool of software than DOS runs.

But does this mean that DOS/*Windows* is the superior product, the one your company should plan its future around? No, not at all.

Windows under DOS is still DOS. And DOS is an operating system originally designed for non-networked, floppy-based computers that perform one task at a time. *Windows* at its best is merely the latest in a long line of products that, over the last nine years, have goosed and tweaked DOS into ever-higher levels of performance. But at a cost: Applications running under *Windows* are slower and more prone to data loss than those specifically designed for OS/2.

For example, OS/2 allocates a protected memory space for each application that's running, whereas *Windows* puts all applications in the same memory space, making it easy for one unruly program to hog, hold up, and even crash the whole system. By the same token, OS/2's preemptive-multitasking feature guarantees processing time to each application, whereas *Windows* relies on the individual applications to grant each *other* time: Again, one application can literally seize the system. *Windows'* memory-management methods are especially risky when several applications are sharing data, as when a spreadsheet and a database gather information simultaneously from a number of sources.

That's not to say that OS/2 hasn't presented its own problems. For example, John Cooper, a consultant from Nampa, Idaho, made the switch from *Windows* to OS/2 because he wanted to be compatible with his current client, a large federal agency, and because the database he uses is too large for DOS to handle. But his early efforts to get his Tandy 4000 SX to talk to his IBM-emulating Tandy printer were a nightmare. Because OS/2, unlike DOS, doesn't communicate directly with hardware, drivers have to be written by the hardware vendors themselves. Not surprisingly, the only hardware vendor whose products were supported from day one is IBM. "OS/2 just wasn't ready for prime time," Cooper complains.

Right now, concedes Microsoft OS/2 Product Manager Pat Bellamah, OS/2 is most suitable for corporations doing mission-critical tasks in a networked environment, such as accessing SQL-server databases. Most of these corporations are writing their own applications, such as American Airlines' OS/2-based proprietary program to fill available flights to the maximum. But all this will dramatically change in the next year.

What will make other businesses justify the cost of moving to an OS/2 platform, Bellamah adds, isn't the ability to make their old character-based software run faster. Instead, it's next-generation software and the opportunity to move to Presentation Manager's consistent, graphical user interface, with its attendant ease of use and training benefits.

"We're banking on *1-2-3/G* having a large impact," says Bellamah. "*WordPerfect* is another one, and we should have a Presentation Manager version of *Microsoft Word* out by the end of the year." Version 2.0 of OS/2, also due out in 1990, promises to run all *Windows* and DOS applications right out of the box, making the migration to OS/2 less painful.

Meanwhile, the hardware commitment to OS/2 may soon become less onerous: IBM and Microsoft have promised to work to drop the memory threshold for OS/2 to 2 megabytes.

Of course, future versions of *Windows* will no doubt continue to incorporate new features. But remember when the first automobiles came out and needed to be recranked every few miles, and their owners were taunted with cries of "Get a horse"? Think of DOS/*Windows* as an old horse who's been plopped on a flatbed railway car.

Sure, it gets you where you need to go, maybe even on time. But wouldn't you really rather have a Buick? ■

Lindsy Van Gelder is a free-lance writer based in New York City.

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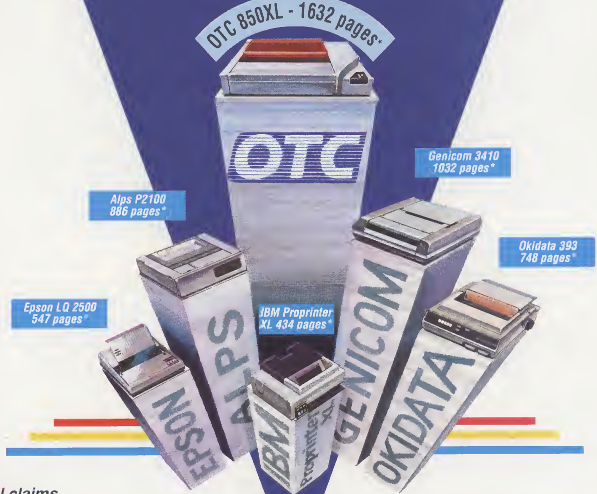

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